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THE ADOPTION OF INFORMATION AND COMMUNICATIONS TECHNOLOGIES BY RURAL BUSINESSES; THE CASE OF THE SOUTH MIDLANDS

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ABSTRACT

In the light of increasing promotion of new information and communications technologies (ICTs) as a tool for economic development, this thesis examines the relationship between ICTs, rural businesses and rural development among rural engineering and manufacturing firms in South Warwickshire and the Cotswolds. Despite high levels of general interest in this subject area, previous research has tended to concentrate on the technical (supply-side) issues of these new technologies; the human (demand-side) aspect has, so far, been largely overlooked.

The devised theoretical framework distinguishes between influential factors internal and external to the firm. Empirical research draws upon humanistic behavioural concepts to investigate ICT adoption decision-making processes at the micro-level of individual sectors, enterprises and entrepreneurs in rural areas, and to evaluate the role of external agencies.

Firms in the study area are diverse in terms of their ICT adoption and use, and entrepreneurial characteristics and linkages with other businesses and organizations are found to be major determinants of technology requirements and uptake. Two types of firms are identified: inwardly-oriented firms, with local buyer and supplier contacts, which make little use of technology; and outwardly-oriented firms, which use ICTs more intensively and have geographically dispersed networks of customers and suppliers.
While notable levels of general awareness of ICTs exist among rural businesses, the initial financial outlay involved, coupled with a lack of knowledge of existing technological solutions and support, and a need for skills training, remain significant disincentives to ICT uptake among smaller firms.

Agencies currently lag behind local businesses in terms of their ICT awareness and use, and understanding of the potential development implications of technology. In many cases there is a mis-match between agencies' perceptions of ICT use in rural firms and their response to this area of business support. Although there is a recognition amongst agencies that their client firms are applying new technologies in their business processes, ICTs are

seen by the majority of agencies as a future component of business strategy. Thus, appropriate support for firms implementing ICTs is not yet widely accessible.

Findings suggest that ICT implementation is not appropriate in all firms; requirements and applications vary widely and there is a need for a tailored approach by agencies and policy makers which takes account of the uniqueness of entrepreneur and firm characteristics.

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ABBREVIATIONS AND ACRONYMS

ACRE	Action with Communities in Rural England
BT	British Telecom
CAD/CAM	Computer Aided Design/Computer Aided Manufacture
CAP	Common Agricultural Policy
CBI	Confederation of British Industry
CC	County Council
CDC	Cotswold District Council
CEC	Commission of the European Communities
CEP	Countryside Employment Programme
CLED	Centre for Local Economic Development
CURDS	Centre for Urban and Regional Development Studies
CWP	Coventry and Warwickshire Partnerships
DC	District Council
DTI	Department of Trade and Industry
EDI	Electronic Data Interchange
EEC	European Economic Community
EFT	Electronic Funds Transfer
E-mail	Electronic Mail
ESPRIT	European Strategic Programme for R&D in Information Technology
ESRC	Economic and Social Research Council
EU	European Union
GCCI	Gloucestershire Chamber of Commerce and Industry
GIS	Geographical Information Systems
HOETEC	Heart of England Training and Enterprise Council
ICT	Information and Communications Technology
ISDN	Integrated Services Digital Network
IT & T	Information Technology and Telecommunications
JIT	Just-In-Time (manufacture)
LAN	Local Area Network
LEADER	Links between Action for the Development of the Rural Economy

LFA	Less Favoured Area
MAFF	Ministry of Agriculture, Fisheries and Food
MIS	Management of Information Systems
NOMIS	National Online Manpower Information Service
PC	Personal Computer
PICT	Programme on Information and Communication Technologies
POTS	Plain Old Telephone Service
PSTN	Public Switched Telephone Network
R&D	Research and Development
RACE	Research and Technology Development in Advanced Communication Technologies in Europe
RBG	Redundant Building Grant
RCC	Rural Community Council
RDA	Rural Development Area
RDC	Rural Development Commission
RDP	Rural Development Programmes
SIC	Standard Industrial Classification
SME	Small and Medium sized Enterprises
SRB	Single Regeneration Budget
TEC	Training and Enterprise Council
WAN	Wide Area Network

GLOSSARY

Behaviouralism

The theory which advocates investigation at the level of the individual, using inductive reasoning and focusing on behaviour to explain outcomes of processes. However, the ultimate aim of behavioural methods is to make generalizations.

Ethnography

Social and cultural anthropology, involving direct observation of an organization or small society. Ethnographic researchers usually gather data by living and working in the society or social setting being researched, immersing themselves as fully as possible in the activities being observed.

Epistemology

The philosophical theory of knowledge, which seeks to inform us how we can know the world.

Humanism

The theory which emphasizes the subjectivity of knowledge, thereby recognizing the intentionality of individuals. Humanism holds that knowledge can only be obtained from what exists in the mind of the individual.

Objective 5b

Following the European Commission's revision of its structural funds in 1987, less developed regions of the European Union designated under Objective 5b were eligible for funding for development programmes 'to reduce rural backwardness'.

Ontology

The theory of what can be known or what exists; seeks to establish the nature of fundamental things which exist in the world.

Political economy

The perspective recognizing the importance of external macro-scale processes in influencing the way in which spatial patterns are created. Over-emphasizes the constraining effect of macro-processes and structures and largely neglects their ability to create opportunities.

Positivism

The view that all true knowledge is scientific; only that which can be directly observed and measured is acceptable as evidence. Positivism is a scientifically-oriented form of empiricism. Hypothetico-deductive reasoning (deriving patterns from theory rather than observation) characterized positivist reasoning in human geography.

Qualitative research

Uses inductive research methods to explore processes and meaning. Involves the observation of human behaviour under natural conditions and seeks to avoid generalization. The end goal is authenticity, rather than reliability.

Quantitative research

Research which employs positivist-inspired methods to identify patterns or outcomes of processes. Useful as a descriptive device, but lacks the power of explanation.

Realism

Theory which recognizes the ability of individuals to make choices within the context of wider processes, but holds that some of the most important influencing factors are unobservable, e.g. structures, processes and mechanisms.

Regulation theory

Conceptualizes theories of capitalist growth, crisis and reproduction, integrating both structuralist and institutionalist perspectives. Examines institutional mechanisms in terms of modes of production, regimes of accumulation and modes of regulation.

Structuralism

Structuralism holds that the behaviour of individuals is ultimately constrained by wider social, economic and political processes and seeks explanation through the study of these general structures which underlie all phenomena.

Structuration

Recognizes both the enabling and constraining power of wider structures on individual behaviour, thus ascribing individuals the ability to make choices. Structuration holds that individuals have the power to change the wider structures which, in turn, influence individuals.

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Chapter 1
INTRODUCTION

1.1 Context and aims

It is widely accepted that we now live in an Information Age in which there is widespread use of information and communications technologies (ICTs) (Webster, 1995). The rapid transmission of data, images and voice has become more affordable and, hence, more widespread in the economy and society. It is widely proposed that these new technologies have the ability to shrink the conventional barriers of time and distance. This is manifest in the advent of new concepts, such as that of the 'global village', which marks a realization that the existing global economy is undergoing spatial restructuring as a result of the use of these technologies. The culmination of these trends is largely due to the development of three major groups of related technologies: telecommunications, information technology (IT) and telematics.

In recent years, the telecommunications environment has been characterized by dramatic change (Hudson & Parker, 1990). Telecommunications have traditionally involved the transmission of voice over distance using physical links in the form of copper wire (RDC, 1989). The plain old telephone services (or POTS) transmitted sound in analogue form in waves or pulses (Graham & Marvin, 1996). Subscribers to the telephone network are connected via 'switching' which involves the 'bundling' together of data followed by transmission through the long distance trunk network by the local telephone exchange to other exchanges which, in turn, re-route the data to respective recipient subscribers (Goddard & Gillespie, 1986). In the past, this process was performed mechanically, but has gradually been replaced by electronic switching.

Advances in computing technology were accompanied by the need for transmission of digital data and the introduction of the modem (modulator/demodulator) which could convert data in digital form to analogue and vice versa. New developments in telephony have meant that the capacity and speed of transmission have increased while its relative cost has fallen. This has been facilitated by the introduction of broadband and fibre optic cabling, combined with digitalization of networks and switching. Fully digital services, or

ISDN (Integrated Services Digital Networks), increasingly being introduced in advanced industrialized nations, are computer controlled and accommodate new telephone services to the extent that the telephone effectively becomes a computer, giving access to stored digital information (Goddard & Gillespie, 1986).

Physical transmission links are now supplemented by radio, microwave and satellite links. The variety of forms in which information may be telecommunicated has expanded accordingly to include audio, visual and digital data. Basic telephony is now virtually universal in advanced industrialized economies such as the UK and equipment such as the fax (or facsimile) which allows the transmission of pictorial material is commonplace in the business environment, regardless of the scale of operations.

In summary, and for the purposes of this research, three major trends in telecommunications development in the last decade have implications for the economy of rural England:

1. The public switched telephone network (PSTN) has been gradually upgraded using optical fibre technology so that it is now based on digital systems technology. This has improved both the speed and quality of transmission and has facilitated the introduction of value added services such as freephone and local rate telephone numbers, access to the Internet and multimedia technology, and data transfer.

2. The number of network providers has increased and with it the level of competition, particularly in and between urban areas.

3. Infrastructure investment has become increasingly market driven (Rural Development Commission, 1996d).

In the area of IT there has been an explosion in the use of computers, both in the business environment and, more recently, in the home. The combination of a growing uniformity in IT equipment and software and the development of user-friendly, mouse-driven, graphical interfaces, such as Windows, has meant that computing technology, once the domain of

large corporate bodies with specialist IT staff, is now within the technical reach of smaller businesses whose staff resources are more limited. This, coupled with rapidly falling fixed costs of IT equipment, has contributed to the reality that even the smallest commercial entities can now consider using IT. The transfer of information both between and within organizations has been facilitated by this increased use of IT in business and commerce, and by improvements in telecommunications and the compatibility of computer systems.

The most important development, however, has been the convergence of information technology and telecommunications (known as telematics), which has facilitated communication between computers across networks. These are the more advanced ICT services. It is this convergence of technologies which Goddard & Gillespie (1986, p.386) suggest is "the essential key to understanding what is happening in the information economy". At this stage, it is appropriate to delimit the range of equipment and applications which come under the umbrella term of ICTs and to define any related terminology which will be used throughout the course of the thesis.

ICTs include information technology and telecommunications, as well as those technologies which result from a combination of the two, otherwise known as *telematics*. The term telematics is derived from the French word *télématique* and denotes the fusion of telecommunications and information technology via computer networking (Clark *et al.*, 1995). Telematics refers to:

> "services and infrastructures which link computer and digital media equipment over telecommunications links ... [and provide] the technological foundations for rapid innovation in computer networking and voice, data, image and video communications"
>
> (Graham & Marvin, 1996, pp.2-3).

Tanner & Gibbs (1994, p.2) have referred to these new technologies as an "inseparable and indistinguishable union of computer and communication technology". What is implied by the term telematics is that "anything which can be computerized can be telecommunicated and anything which can be telecommunicated can be computerized" (Grimes, 1992, p.270).

The terms 'telematics' and 'ICTs' are often applied interchangeably in the existing literature, so it is important to clarify their use for the purposes of this research. In this thesis, the term *ICTs* encompasses the whole range of information, communications and telematics technologies which may be applied in the business environment, from the most basic (such as phone and fax) to the more elaborate (such as Electronic Data Interchange (EDI) and videoconferencing). The term *telematics* is used to denote only those technologies which arise from the *convergence* of computing and telecommunications. Table 1 summarizes several of the main telematics applications; more details of applications and equipment in business use may be found in Appendix 1.1.

Table 1.1 Telematics applications and services currently available

Application	Description
CAD/CAM (Computer Aided Design/Manufacturing)	includes the ability to work jointly at different locations via shared information on computer screens
E-mail (Electronic mail)	sending messages and often files via computer and telephone line, including accessing databases
EDI (Electronic Data Interchange)	exchanging data, such as orders and invoices, often between suppliers and customers, in electronic form using standardized formats
EFT (Electronic Funds Transfer)	making payments via a computer link (for example using a debit card)
Teleconferencing	holding meetings with more than two people using a telephone link
Teleshopping/Telemarketing	buying and selling goods via an electronic online catalogue
Teleworking	work carried out using telematics infrastructure (e.g. phone, fax or E-mail) at a place other than that where the results of the work are needed
Videoconferencing	holding meetings via a videolink, linking several people at studios in more than one location or using desk-top PC-mounted cameras
Videotex/Teletext	allows accessing of data via a television or PC (e.g. Minitel in France; Prestel in the UK)

Source: **Definitions from TURA (1995b, p.9).**

These technologies are now much more accessible so that their use is no longer restricted to larger businesses and organizations. Technological developments have meant that a wide range of applications are within the reach of smaller businesses, in terms of both their technical skills and financial capability.

1.2 The implications of Information and Communications Technologies for rural development

Telematics have made possible the communication of information both between and within organizations. This, coupled with the fact that most advanced economies now have more than 40% of their workforce employed in the information sector (Ilbery *et al.*, 1995), means that telematics have enormous potential to promote economic development. This is particularly true of more remote peripheral and rural areas where distance creates a significant barrier to traditional forms of communication. The economic success and viability of regions is thus becoming increasingly dependent on the extent to which they adopt and use ICTs.

There has been a high level of general interest in the promotion of ICTs as a tool which could benefit businesses, particularly those in rural areas. The potential is increased because of changes in the characteristics of rural areas which have, today, become much more economically diverse. In recent years many firms have opened in or moved to rural areas and, as a result, rural economies are less dependent on agriculture and related activities. They are thus more susceptible to the influence of the new information and communications technologies more prevalent in other sectors of the economy. In addition, with this restructuring of rural areas, there is a continuing need to attract alternative economic activity to the countryside to compensate for the employment shortfall in agriculture and retain the rural population. Trends in the restructuring of rural areas are discussed in more detail in Chapter 2.

Many writers and policy makers believe that the adoption of ICTs in rural areas can encourage the diversification of the rural economy and retention of jobs therein, thus sustaining rural communities. Telematics are seen by the European Commission as "a key

tool in local and regional development" (TURA, 1995a, p.11). A significant number of initiatives have been conducted under the auspices of the European Union in order to research and implement telematics applications as a means of promoting economic development in peripheral, rural and less-favoured regions. These initiatives include, for example, the ORA (Opportunities for Rural Areas) programme, under which a range of projects were funded to improve the telematics infrastructure of rural areas and to stimulate ICT use. Chapter 2 examines more closely the implementation of several such policy initiatives and assesses their impacts in terms of rural development.

However, researchers and strategists in other quarters have recognized that ICTs are not a panacea and, far from solving all the problems of peripherality, may serve to exacerbate the domination of marginal rural areas by the urban core (for example, Grimes, 1992). Research carried out under PICT (Programme on Information and Communication Technologies) sponsored by the UK Economic and Social Research Council (ESRC) has revealed the complex nature of the relationship between the application of ICTs and their social, economic and cultural implications. This research highlights more readily the risks associated with the implementation of ICTs. These conflicting views are examined in more detail in Chapter 2 which presents a review of the current debates surrounding the subject.

Despite the high level of interest in general terms, however, there is a lack of empirical research into the relationship between ICTs, *rural* businesses and *rural* economic development. To date, despite a substantial body of research into the technical and supply issues surrounding new technologies, there has been little research carried out at the micro level of individual sectors, enterprises and entrepreneurs in rural areas. Evidence for this gap in the literature is discussed more fully in Chapter 2. A need exists to understand both present and likely future levels of uptake and use of the new technologies and services by rural businesses, how they might benefit rural areas and how this could be assisted by policy. The means by which it is proposed that such an insight may be gained is described in the theoretical framework presented in Chapter 3.

In order to satisfy this identified need, the specific aims of this research are threefold:

1. to identify and account for current levels of use of ICT applications in rural businesses;

2. to determine the potential for further uptake of ICT applications among rural businesses in selected industrial sectors;

3. to assess the implications of business use of ICTs for rural planning and economic development.

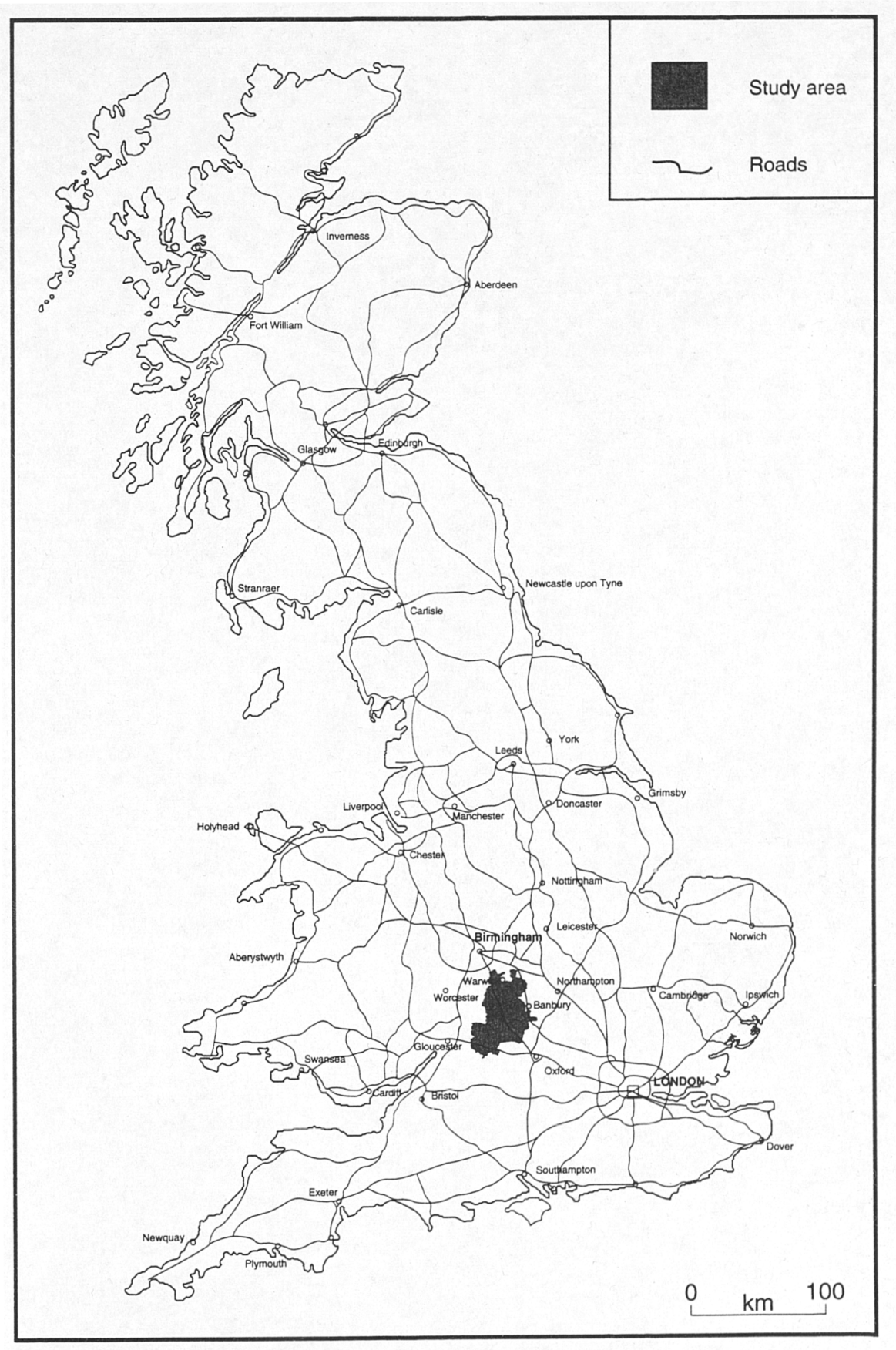
To meet these aims, the research identifies one particular industrial sector, that of manufacturing (including both 'engineering' and 'other manufacturing' firms), in which to examine the uptake and use of ICTs. The research specifically investigates small and medium sized enterprises (SMEs), since it is widely believed by writers and policy makers that it is within this sector of the economy that most growth can be expected to occur in an Information Society. This holds particular relevance for rural areas where firms in this smaller size range predominate.

1.3 The study area

The chosen study area is defined by post code districts and comprises the accessible rural areas of south Warwickshire, east Gloucestershire and west Oxfordshire in central England (refer to location map Figure 1). The suitability of this area for the research is based on its accessibility and on the diversity of its economy and is discussed more fully in Chapter 4. Despite being genuinely rural in character, the area is centrally located and well connected to the major urban centres of Birmingham and London by the nearby motorway network. It is also well served by communications networks and thus firms in the area can, in theory at least, avail of the majority of the new ICT services described earlier.

The area is comparatively prosperous with a healthy economy and below average unemployment, although pockets of deprivation and marginalization do exist. The north of the area (in south Warwickshire) has a long tradition of manufacturing and engineering employment, while the south of the area (in Oxfordshire and Gloucestershire) has historically been heavily dependent on the defence industry, now in decline. Thus the area, as a whole, is endowed with a large pool of skilled labour within the engineering and manufacturing sectors upon which this research concentrates. Rates of small business growth and survival are favourable in comparison with the national average. The combination of these factors (i.e. a preponderance of SMEs and a highly skilled local labour force) is likely to heighten susceptibility to the adoption and use of advanced ICTs in local businesses. The area thus facilitates research into the potential for future uptake of these technologies among businesses and the likely effects on rural economic development. A more detailed overview of the economy of the study area is provided in Chapter 4.

Figure 1.1 Location of the study area



1.4 Structure of the thesis

Having introduced the broad aims of the research and the wider context within which the adoption and use of ICTs is to be studied, the rest of the thesis proceeds in seven subsequent chapters. Chapter 2 critically reviews current debates in the literature on the role of technology in rural development, examining the three main themes within the research: ICTs, rural businesses and rural economic development. Chapter 3 examines more closely the various approaches which have been applied to the study of ICTs in rural development and conceptualizes the main focus of the research: the implications of the business use of ICTs for rural development. In this chapter an appropriate theoretical framework, upon which to base the empirical work, is proposed. The following chapter (Chapter 4) describes the research methodology employed and details the techniques by which the collected data are analysed.

The remaining chapters report the findings and implications of the research. Chapter 5 presents evidence from the extensive survey of rural businesses, ascertaining the patterns of uptake and use of ICTs among manufacturing and engineering firms. Chapter 6 reports the further development of this research through the intensive investigation of factors which influence the patterns of ICT uptake and use revealed in the previous chapter. This chapter investigates the nature of causality in the decision-making process with respect to ICT adoption. Chapter 7 presents the findings of the survey of local external agencies, examining in detail their role in the economy and their perceptions of and approaches to the adoption of ICTs by rural businesses. This chapter also explores the likely future role of ICTs within agencies' strategies and the related implications for rural development. The final chapter (Chapter 8) provides an overview of the main research findings and discusses in more depth their implications for both the businesses concerned and the development of the wider rural economy. This chapter reveals the extent to which the views of external agencies differ from that which is revealed by the empirical research and puts forward a number of recommendations for policy makers. Finally, the problems encountered in the course of the research are discussed and suggestions as to directions for future research presented.

Chapter 2

TECHNOLOGY AND RURAL DEVELOPMENT: CURRENT DEBATES AND RESEARCH REQUIREMENTS

2.1 Introduction

This thesis incorporates three central themes: Information and Communications Technologies (ICTs), rural businesses (particularly small and medium-sized enterprises (SMEs)), and contemporary rural economies. The implications for the economic development of regions of the increased uptake and use of ICTs have been debated at length (for example, Taylor & Williams, 1990; Grimes, 1992; Gillespie *et al.*, 1994; Goddard & Gillespie, 1986; Bryden *et al.*, 1996; etc.). It is the purpose of this chapter to critically review the existing literature, contextualizing the research topic within current debates about the role of ICTs in the development of rural areas. In examining the literature, the chapter identifies the gap in existing knowledge about the particular relationship between the use of advanced ICTs in rural businesses and the economic development of rural areas. In doing so, it demonstrates how this thesis will endeavour to enhance current understanding of this topic.

This review of the literature exposes a number of areas of deficiency in existing knowledge of the research topic. Firstly, previous research on SMEs has often ignored ICTs. Research that has examined this area has generally focused on either the technology itself or the diffusion of technology among firms, rather than the wider impacts of this technology. Secondly, while some studies of ICT uptake have examined sectors such as the transport industry and others have considered specific sectors in urban areas, none have yet investigated the uptake of ICTs in a specific business sector in a rural area. Thirdly, the way in which ICT adoption/uptake occurs has so far been largely overlooked in the literature; the decision-making processes behind the uptake and use of ICTs by rural businesses have not yet been adequately scrutinized by research in this field. If the process of ICT uptake and its associated impacts are to be more fully understood, there is a need for research which follows the process of ICT adoption right through, from the decision-making process to uptake and use and, ultimately, to impacts. Finally, there is little existing research which has examined the role of ICTs in rural economic development

from the point of view of both the firm and the external agency. There is a need for a more holistic approach to research which examines both the internal processes, operating within the firm, and those external to the firm (such as those influenced by advisory bodies and rural development agencies). Such an approach is well placed to offer new and informed explanations as to how and why rural businesses adopt and use ICTs and the potential impacts this use will have for local rural development.

The chapter begins by acknowledging the breadth of literature which exists on the increasing role of ICTs in economy and society, identifying the particular branch of this work upon which the thesis focuses, i.e. ICT use in rural businesses. Secondly, the validity of the concept of the 'rural economy' is challenged within the context of the wider debate surrounding the definition of 'rural' and what constitutes a rural area, given the vast range of types of rural area which exist. This section also examines various typologies of rural areas which have been constructed, including those related to their potential to benefit from ICTs. The literature on the role of SMEs in rural economies is then reviewed, demonstrating the need for empirical work which specifically investigates the processes behind ICT uptake and use by businesses in rural areas. The chapter then turns to the views of external agencies on the role of ICTs in economic development and how these have been translated into regional policy initiatives and development strategies, particularly in peripheral and rural areas. The role played by agencies acting at a local level in rural economies is discussed and the plethora of ICT-based development projects instigated by the European Commission (as a result of the conjecture that ICTs constitute a major tool with which to improve the economic well-being of regions) is reviewed. Finally, the implications of the literature review for the focus and direction of this research are highlighted.

2.2 Geographical impacts of Information and Communications Technologies

In recent years there has been a proliferation of new ICTs as the advanced industrialized nations have been the subject of an "information revolution" (Hepworth, 1989). Information technology has infiltrated virtually every field within economy and society and is widely believed to be "of crucial importance to development and economic success both in individual enterprises and in nations" (House of Commons Trade and Industry

Committee. Cited in Hepworth, 1989). Rapid low-cost transmission of data, images and voice has been made possible by these new technologies, and much speculation has arisen amongst analysts and planners over their implications for economic development, particularly through business use.

ICTs have practical benefits for businesses and business people, enabling them "to talk, exchange documents, transfer funds, make payments, process and transmit data and interrogate a wide range of supplier, product and management information databases" (Clark *et al.*, 1995, p.173). ICT applications allow the assemblage, processing and transmission of digital data, facilitating interaction and collaboration between remotely located organizations and individuals (Grimes, 1992). Grimes differentiates between two types of ICT applications: "'teleassisted' services, where telecommunications are only a means in the production of the services (such as offshore data-processing of 'telework'), and 'telebased' services where telecommunications are an integral part of the service concept ... [such as] databases, videotex and electronic mail (Grimes, 1992, p.270).

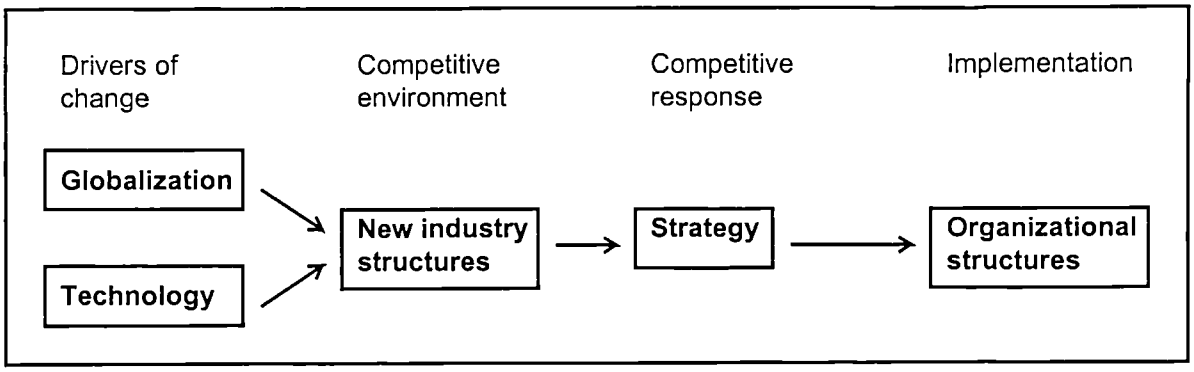
The information economy which has emerged is held by many to be the manifestation of the fifth Kondratieff (or long-term economic) cycle - the Information and Communication Kondratieff - with the main growth sectors now being those of computers, electronics and micro-electronics, telecommunications equipment, optical fibres, robotics, etc. (King, 1983; Freeman, 1987; Gillespie, 1987). Goddard & Gillespie (1986, p.383) suggest that "advances in telecommunications technology ... are embedded within, and are helping to facilitate the development of, a much broader and more fundamental shift in the nature of the economic base of our society". According to many authors in the field, this emerging information economy has entailed a post-Fordist shift away from mass production as a response to rapidly changing consumer tastes (Hepworth, 1989; Grimes, 1992; Gillespie *et al.*, 1994). There has been an accompanying shift away from adherence to the principle of 'economies of scale' towards one of 'economies of scope' (whereby the production of a range of different product designs may be produced in a manner which is equally cost efficient to the production of a range of products of the same design (Gillespie & Williams, 1988; Grimes, 1992; Gillespie *et al.*, 1994).

There has been a departure from the traditional ideas of physical resources and a move towards knowledge-based resources, the key resource now being information (Grimes, 1992). Hudson & Parker (1990) refer to the concept of "rural penalty" which they suggest is overcome in an information society due to this change in the nature of production:

> "In the provision of physical goods and services, rural areas could only compete across barriers of distance and geography if they had a natural resource advantage. In the provision of information goods and services, reliable telecommunications infrastructure can make geography and distance irrelevant"
>
> (p.195).

Unfolding in the literature is the concept of globalization through technological innovation, whereby ICTs, driven by converging global similarities in the demands, and changing needs, of customers, are remoulding the competitive environment. Globalization and technological innovation have been termed "drivers of change". Their action has been conceptualized by Bradley *et al.* (1993) (Figure 2.1).

Figure 2.1 Globalization and technology as drivers of change



Source: Bradley *et al.* (1993), p.4.

The effects of this globalization and recent trends towards global interdependence have been to reduce the significance of physical barriers through "space adjusting technologies", leading to a phenomenon known as "time-space convergence" (Janelle, 1991). However, as with most innovations throughout historical development, the effects have been spatially uneven and thus national core regions have benefited more from the new communications technologies than have peripheral regions. In the same way, global core regions (e.g. the industrialized North) have benefited more than the newly developing countries and former colonies and, indeed, often at their expense. Gillespie (1987) explains this by highlighting

the importance of 'regional information environments' which are usually located in the core regions. He suggests regional information environments are determined by a range of economic and social factors, including a region's "stock of knowledge", the "quality and intensiveness of its information networks" and the "nature and variety of its communication and information links with the rest of the world". Without a sufficiently rich information environment, regions are unable to produce self-sustaining, indigenous growth and development - this is particularly true of many disadvantaged peripheral and rural regions (Gillespie, 1987, p.232).

However, the structural economic changes which are taking place in advanced economies are changing the way in which peripheral and rural areas are being incorporated into the wider national economy and this has both positive and negative consequences for rural areas. On the positive side, the new industries are more footloose and not locationally tied to the urban centres as were many of their predecessors. This has been possible through the growth of information services which have also facilitated the decentralization of decision-making. There are also disadvantages such as the increased need for access to specialist services which are generally not easily accessible in many rural areas, particularly those which are remote. On the whole, however, the general consensus is that telecommunications have increased the interconnectivity between rural areas and the wider economy, making sustainable many activities which were previously not viable in rural areas (Gillespie *et al.*, 1991).

Opponents of this view suggest that, on the contrary, telecommunications developments (and ICTs in particular) may help core areas to further exploit peripheral areas. The information economy perspective on the role of ICTs in economic development serves to illustrate this point. Geographically, Goddard (1992) suggests that the information economy perspective involves four contentions:

1. Information is becoming the key strategic resource upon which the delivery of goods and services in all sectors depends. The fact that cities have always been the focus of information exchange and distribution serves to increase their importance as the role of

information in the economy increases. This has implications for rural and peripheral areas.

2. The convergence of computer technology and telecommunications (i.e. telematics) is becoming a key spatial component in the infrastructure of the information economy and is also increasing the role of major cities which are acting as nodes for the resultant networks.

3. The increased tradability of information has resulted in the transformation of traditionally information-based sectors of the economy and the growth in the externalisation of business functions. This, in turn, results in more interaction between organizations and, again, contributes to the persistence of the city as a convergence point for communications.

4. The growth in the 'informatisation' of the global economy is manifested in increased integration between national and regional economies. This accentuates growing disparities in economic wealth and development between regions.

> "Far from eliminating differences between places, the use of information and communications technology can permit the exploitation of differences between areas, for example in terms of local labour market conditions, the nature of cultural facilities and of institutional structures. ... Even in the information economy, geography matters!"
>
> (Goddard, 1992, p.180-181)

More recent literature has recognised the "self-reinforcing" nature of core regions in their dominance over peripheral areas and the way in which this is translated into a greater ability to access and benefit from new ICTs and information-based activities (Berkeley *et al.*, 1996). It has also been suggested that, likewise, rural regions will benefit disproportionately in relation to their accessibility; those regions which are more accessible, generally located close to main urban areas (Hansen *et al.*, 1990; Keeble *et al.*, 1992), stand to gain more, economically, from the use of ICTs. Variations between rural areas are discussed in more depth in section 2.3.

ICTs constitute a powerful technology and, as this section has shown, are widely believed to be able to facilitate economic and regional development (Berkeley *et al.*, 1996; Bryden *et al.*, 1996; Hudson & Parker, 1990; Giaoutzi & Nijkamp, 1988). This is due to their ability to overcome the physical barriers to communication of time and space, termed 'space annihilation' by Hepworth (1989), and to provide cheaper means of communicating information, particularly to more remote and rural areas. This ability to transcend space and time, though lately contested from some quarters (e.g. Garnham, 1994), means that the potential impacts of ICTs have particular relevance for rural areas which have traditionally suffered economically and socially as a result of such physical/geographical marginalization.

Many authors have extolled the benefits of ICT use in practical projects implemented in rural areas, but before their work is reviewed, it is useful to refer to the literature pertaining to rural areas and the conceptualisations of the 'rural economy' and 'rural development'. This is the focus of the following section.

2.3 Rural economies and rural development

This research is concerned with how rural development might be encouraged through the adoption and use of ICTs by businesses in rural areas. It is thus necessary to define both what is meant in this context by the term 'rural' and the concept of 'rural development'. Furthermore, it is essential to examine briefly some of the major processes shaping contemporary 'rural' economies in order to establish the context within which new technologies are being adopted and used, and within which likely impacts of this use will occur. These aspects of rural economies are the focus of this section.

Rural economies

An appropriate starting point is to deal with what exactly constitutes a 'rural economy'; in other words, to examine the definition of 'rural'. Many authors have struggled with this concept in varying degrees of detail (including Cloke, 1980 & 1987; Hoggart & Buller, 1987; Pacione, 1983 & 1984; Robinson, 1990; Saraceno, 1994). Most would agree that existing definitions of rural are fairly vague. Pacione (1984) described the search for a

precise definition of rural as an "elusive goal" (p.1), while Cloke (1980) emphasized the need for a conceptual framework to recognize what 'rural' is and what distinguishes 'rural' from 'urban'. Certainly, now more than ever, there appears to be a blurring of the boundaries between these two.

Saraceno, in examining "old conceptualizations" of rurality, notes the association which has traditionally been drawn between rural areas and their primary mode of economic activity. "'Rural' (a spatial category) has been considered as coincident with agriculture (a sector of activity) and opposed to 'urban' (a complementary spatial category), coinciding with industrial activities and services" (Saraceno, 1994, p.322). Hoggart & Buller dispute definitions of rural which are occupational (based on the premise that rural areas are dominated by primary industries and that all agriculturalists uniformly hold a similar set of social values) on the grounds that a growing "bifurcation of agriculturalists is clearly apparent between large-scale corporate farms and small scale (often part-time farms)" and hence the modern farming sector can no longer be regarded as one uniform group. However, this still emphasizes agriculture as the prevailing economic activity in rural areas, which is no longer the case.

Traditional views of rural areas have created a number of impediments to a more pragmatic approach to the study of all things 'rural'. Firstly, there is the idea that there exists a 'rural urban continuum' (discredited in the mid-1960s, but still underpinning many commentaries on the concept of rurality (Hoggart, 1988)). The implications of such a continuum are that rural areas lag behind urban areas, do not integrate with them and display an 'endemic' resistance to change (Gillespie, 1987). One of the inherent problems with the continuum concept is the ease with which it may be reduced to a mere dichotomy - i.e. urban versus rural - which is contrary to the views of many who consider the distinction between the two to have practically disappeared (for example Grimes, 1992; Saraceno, 1994). Townroe emphasizes the close ties between contemporary rural and urban areas of Britain, suggesting that, socially at least, "it is almost impossible to distinguish rural society from urban society". Economically, he adds "rural Britain is not just linked to urban Britain, but in most of the relevant characteristics it is a continuation of urban Britain, but at a lower density" (Townroe, 1991, p.1).

However, such views tend to under-estimate the important differences which *do* exist between what are known as 'rural' areas from those deemed to be 'urban' and, in addition, to reinforce traditional notions that rural areas are merely passive consumers of change as opposed to their urban counterparts wherein such change is actively initiated. There are several approaches to resolving such debate for the purposes of defining a basis upon which to develop this research. Firstly, there is the option, put forward by Hoggart (1990) - "doing away with rural" - which he describes as a "chaotic concept" (p.247) and, instead, examining the causal processes common to particular localities. Other authors have, more recently, adopted the definition of *local* economies (e.g. Halfacree, 1993; Saraceno, 1994). Still others have attempted to resolve the debate through the development of typologies of rural areas (Keeble *et al.*, 1992; Millard *et al.*, 1992; Richardson & Gillespie, 1996). These approaches necessitate a closer examination of the structural changes which are occurring in contemporary rural economies within the wider context of globalization.

Rural areas are currently being shaped, to a greater or lesser extent, by a number of different forces. Two of the most dominant forces operating in the rural areas of developed market economies are the *modernization of agriculture* and the *ruralization of industry*. The modernization of agriculture has had some unfortunate consequences, such as over-production and surpluses, coupled with declining farm incomes and environmental degradation, resulting in many farmers being forced out of business (Bowler, 1992). There has thus been a major shift to off-farm sources of income (Munton, 1990) and, linked to this trend, a rise in the number of part-time farmers and the demand for other non-agricultural jobs in rural areas to supplement farm incomes. These increasingly come from sources such as engineering and other manufacturing industry in rural areas. Linked to the modernization of agriculture, although a distinct process in itself, is the ruralization of industry (Healey & Ilbery, 1985). The last three decades have seen rural areas in the UK (like those of most other advanced industrial economies) experience "a remarkable, relative and often absolute growth of manufacturing ... as part of a massive urban-rural shift of manufacturing activity" (Keeble & Gould, 1985, p.197). This shift has been indicative of both the increasing demand for employment in the countryside and the changing needs and wants of many industries. In Britain, this process has been most

pronounced in East Anglia (i.e. Cambridgeshire, Norfolk and Suffolk) (Keeble & Gould, 1985). Many firms have relocated following the attractions of cheaper factors of production, such as land and labour, which are available in rural areas. Other reasons for relocation in the countryside include the desire of many entrepreneurs (and employees) to live and work in the countryside (counterurbanization) where the quality of life is perceived to be better. In recent years many more small businesses have started up in the countryside than in urban areas (North & Smallbone, 1993).

The consequences of these two major trends (i.e. the modernization of agriculture and the ruralization of industry) acting simultaneously in rural areas have been an increased need for non-agricultural businesses to sustain the livelihoods of the rural population, and a movement of industry into the countryside because of the attractions it holds. Lowe *et al.* suggest that "the demise of the state-supported model of agricultural development which placed an overriding priority on the production of food" has been particularly important in opening up new opportunities for the differentiation of countryside activities and the diversification of the rural economy (Lowe *et al.*, 1990, p.205). Rural economies are "undergoing fundamental changes and there is an urgent need to attract new forms of economic activity to substitute for the decline in agricultural employment" (Ilbery *et al.*, 1995, p.56). Non-agricultural businesses are thus coming to the forefront in the study of rural economy and society and, indeed, have become an integral part of the rural development process. Further research in the area of rural business is therefore justified.

Other important forces of change in rural areas are related to population. According to Moseley (1991), and contrary to popular belief, many rural areas in the post-war period have gained rather than lost population. This overall trend comprises a number of processes operating simultaneously and associated with social and economic conditions:

- *depopulation* of the remotest areas (particularly by younger people) due mainly to the decline in employment opportunities, but also to the lack of social and cultural amenities characteristic of small rural communities
- *urban decentralization* linked to the manufacturing shift and the dispersal of employment from the inner urban areas, but also to the search for better living standards

- *retirement migration* and *holiday homes* whereby certain elite societal groups seek housing in attractive rural areas
- *local restructuring* whereby larger rural settlements have been growing at the expense of surrounding smaller communities

(Moseley, 1991, p.299).

The pressures of tourism and recreation also increasingly exert an influence upon rural areas. Just as the perception of the countryside's aesthetic environmental value is encouraging more business start-ups and relocations through the attraction of entrepreneurial individuals, so this amenity value also attracts the more mobile urban population for recreational purposes. Thus consumption (rather than production) of the countryside is an increasingly important issue in many rural areas.

Global economic restructuring, a process which has been going on since the 1970s, has changed the way in which localities (including rural areas) compete with one another in markets for goods and services. Saraceno (1994, p.321) argues that, as a consequence of these global changes, and the related changes which have been occurring in rural areas, rural economies should not be considered as isolated from the global economy. It is no longer appropriate to refer to 'rural economies', but instead "local economies [appear to be] the new relevant unit of analysis". The related changes in rural areas include the reversal of migration trends (from depopulation to repopulation) and the spatial diffusion of economic activities (comprising the redistribution of employment and enterprises away from urban and towards rural areas accompanied by a more social change in the perceptions of rural areas). Such changes have resulted in the increased competitiveness of local economies.

This 'rural renaissance', Saraceno suggests, is the result of a number of processes. Firstly, growing segmentation of the demand for certain products in the world market has meant that capital intensive, low skilled, long series production processes have moved to developing countries, while short series production processes, requiring highly flexible and technologically advanced organizations with skilled labour, have concentrated in industrialized economies. Smaller enterprises can respond more rapidly to the fluctuating demands of short series production processes and have thus gained the competitive edge

over larger businesses. Saraceno suggests that this process has shifted the 'centre of gravity' in the location of economic activities towards emerging local economies, including rural areas. Secondly, there has been an increase in the demand for niche products, an area in which rural locations are often highly competitive. Thirdly, spatially dispersed smaller businesses are increasingly networking in an attempt to capitalize on their combined specialisms. Fourthly, new communications technologies are allowing businesses to operate competitively in 'non-central areas'. Finally, the urban demand for 'rural amenities' has been growing as the problems associated with urban living (such as pollution and the high costs of housing and land) have increased (Saraceno, 1994).

In his paper for the Rural Development Commission examining key social and economic trends in rural England in the 1990s and their future likely impacts, Rogers (1993) identifies several changes occurring in rural areas. These include counterurbanization, social restructuring, economic change and technological developments. He points out that new communication technologies may have as profound an effect on rural life in the future as the car in the 1950s and the television in the 1960s (Moseley, 1995), adding weight to the argument that the future likely impacts of ICTs in rural areas warrant further investigation.

Saraceno argues that the increasing global competitiveness and integration of rural areas, coupled with the spatial redistribution of population and economic activities in rural areas, necessitates a rethinking of 'rural' as the spatial unit of analysis. Urban-rural dichotomies are no longer relevant as these are no longer homogeneous categories. This is particularly true of those areas which have been becoming 'periurban' or areas of 'diffused industrialization', since they are increasingly different from areas displaying those characteristics traditionally deemed to be rural (Saraceno, 1994, p.329).

Calls to reassess the use of the term 'rural' have come from various quarters. It has been suggested, for example, that the traditionally undifferentiated use of 'rural' as a defining mechanism in research threatens the progress of social theory (Hoggart, 1990). This is based upon the proposal that, at a local level, areas are influenced by causal processes which, in turn, are based upon locally specific social structures which produce behavioural

outcomes via the filtering effect of human agency. These local causal processes are neither distinctive in rural areas nor uniform within them (Hoggart, 1990, p.249). Hoggart suggests that rural areas should therefore be differentiated by their structural circumstances and the different behavioural outcomes associated with these particulars. Consistent with the work of other rural theoreticians reviewed here (e.g. Moseley, 1995; Rogers, 1993; Saraceno, 1994), he refutes approaches which attempt to examine 'rural' in isolation from the 'non-rural' and 'urban'.

Locality-based approaches to the issue of defining the 'rural' are also exemplified by Halfacree (1993), who proposes that theories of social representation (i.e. individuals' images and conceptualizations of their environment) can also inform the debate. Social representations are, at the same time, interpretative, creative and transformative through the medium of human agency (Halfacree, 1993, p.29). Halfacree goes so far as to suggest that social representation has become so important that 'rural as space' may well have been superceded by 'rural as construct', so that the "chocolate box myth" of the rural may not be a myth after all (p.34).

Of the plethora of approaches to rurality which have been pursued, many have highlighted the interdependencies which exist between rural and urban areas. However, it has been argued that although there is considerable debate over what constitutes rurality, the term 'rural' is still useful in so far as it serves to "delimit the scope of research endeavour" so long as it does not "serve as an indiscriminate basis for assumptions about causality" (Hodge & Dunn, 1992, p.20).

However, despite this debate over whether or not 'rural' exists as separate from 'urban', there is widespread agreement that there is considerable variation between those areas traditionally termed 'rural' (including Cloke, 1980; Healey & Ilbery, 1985; Moseley, 1979). Many researchers have therefore attempted to categorize rural areas. For the purposes of this research, two main forms of typology are recognizable: those classifying rural areas *per se* (Cloke, 1977; Cloke & Edwards, 1986; Keeble, 1980), and those classifying them according to their potential to adopt and benefit from ICTs (Millard *et al.*, 1992; Richardson & Gillespie, 1996).

1. Typologies classifying rural areas per se:

Cloke's (1977) index of rurality for England and Wales was an attempt to express subjective ideas about rurality in a more objective statement of "rural-urban differentials". Based on administrative rural districts, the index relied on 16 variables considered by Cloke to be capable, in combination, of distinguishing between areas of differing type. The socio-economic variables used were derived from the 1961 and 1971 censuses and included population change, population density, commuting out patterns, in- and out-migration, and distance from urban nodes of particular size and occupational structure. The index drew heavily on the rural-urban continuum concept and resulted in a four-fold classification of rural districts tending from areas of greatest rurality to urban areas as follows:

- extreme rural
- intermediate rural
- intermediate non-rural
- extreme non-rural.

The index was later re-worked using 1981 census data by Cloke and Edwards (1986). It was intended simply as a 'rephrasing' of the current theoretical thinking at the time and as a basis for comparative research into rural areas, but has since been questioned by Hoggart who stresses the dangers of taking such an index at face value and thereby "ignoring fundamental questions about the nature and causal importance of 'rural' (Hoggart, 1988, p.35).

Moseley has also reflected on Cloke's index, suggesting that a more fruitful approach would involve highlighting the variation between rural areas and their interaction with their urban counterparts. He distinguished two types of rural area in terms of their accessibility: those which are remote from urban areas and those lying within commuting distance of urban areas, which he termed "dormitory or exurban areas" (Moseley, 1979, p.5). He further maintained that the characteristics of rural areas are inextricably linked to urban areas via migration flows. This close connection between rural and urban areas was

reiterated in later work, in which Moseley identified similarities in the socio-economic problems of remote rural areas and those of inner urban areas, including a falling demand for labour, high unemployment, restricted opportunities for school leavers and selective out-migration, linked with a precarious future for local services and low community morale (Moseley, 1991, p.310).

Keeble (1980) produced a typology of rural areas, distinguishing between 'accessible' and 'remote' rural areas. Fothergill *et al.* (1985) later put forward a classification of rural areas, starting with a definition of 'rural' based on local authority districts, in order to enable the use of official statistics. Their definition of rural districts as those "in which all settlements had fewer than 35,000 people in 1971" was flawed, however, since it included some areas which are very non-rural (in the traditionally accepted conceptualization) such as coalfields and suburbs.

2. Typologies classifying rural areas by their ICT potential:

Hansen *et al.* (1990), reporting the findings of a Europe-wide study on the economic implications of stimulating applications of telecommunications in rural areas, "found no satisfactory procedure in the literature for classifying areas according to their rurality" (p. 208). They therefore devised an "index of rurality" which highlighted population density and income as the two main discriminating factors. The index classifies regions of Europe as follows:

- very rural
- rural
- intermediate rural
- intermediate urban
- urban
- very urban.

This index allowed study areas to be identified on the basis of their relative 'rurality'. The research then used modelling techniques to examine the likely benefits from telecommunications investments in various types of rural area. The study showed that the

degree of rurality did affect the potential economic gains from technology, with "higher benefits over costs for more rural areas than for less rural areas". Extremely rural areas were unlikely to benefit as much as less rural areas in terms of increased incomes and employment opportunities. The researchers interpreted this as being due to the need for a minimum level of general infrastructure (not including telecommunications and IT) as a prerequisite for sustainable economic growth (Hansen *et al.*, 1990, p.221).

More recently, Millard *et al.* (1992) classified rural areas in terms of their potential to use and benefit from telematics in terms of rural development. The typology drew on five major characteristics deemed to be associated with the demand for telematics systems in rural areas: accessibility, settlement patterns, population, socio-economic profile and existing telematics systems. The results proposed five categories of rural area:

A. Urban imprint zone
B. High amenity and advantaged areas
C. Developed and balanced areas
D. Areas with development potential
E. Areas requiring economic restructuring.

In general, the market potential for telematics systems ranges along a gradient from high to low from category A to category E. However, the authors suggest that even in 'weak' areas, the typology can aid the identification of potential markets for telematics systems, as there are various mixes of market to be found in areas represented by the typology (Millard *et al.*, 1992). However, the classification has been criticized for its complexity and its inability to be applied in practice due to a lack of suitable data (Gillespie *et al.*, 1994).

Gillespie *et al.* (1994) report on the successful application of an alternative classification scheme which differentiates areas in terms of their telecommunications potential. This approach (developed by Gillespie *et al.* (1991)) uses multivariate analysis to measure criteria (including economic structure, workforce, demography and lifestyle characteristics) which are believed to be related to the potential of an area to implement and benefit from telecommunications. The measures are intended "to specify aspects of

the local 'environment' that are conducive or not conducive to the utilization of telecommunications for economic development" (Gillespie *et al.*, 1994, p.205). 47 variables were grouped into four categories:

1. Economic structure and entrepreneurial potential
2. Labour supply attributes
3. Lifestyle and wealth indicators
4. Accessibility and geographical attributes.

The analysis found that three variables were responsible for most variance in the data and thus could be considered as influencing telecommunications potential. These factors were 'rural entrepreneurship', 'preponderence of information professionals' and 'metropolitan connectivity'. The authors propose that the variability in the telecommunications potential between rural areas highlighted by the results is important in that it both serves to challenge rural stereotypes and suggests that the role of telecommunications in economic development will be accordingly differentiated (Gillespie *et al.*, 1994, p.211). In emphasising the significance of entrepreneurs in influencing the potential for areas to benefit from advanced telecommunications implementation, the research exposes a need for further investigation into the underlying reasons for this. The examination of the role of individuals with decision-making power in rural businesses is thereby necessary if the part played by ICTs in rural development is to be more fully understood.

Rural development

Rural development, a term often used very loosely to refer to broad, indistinct change, has been defined by Copp (1972, p.519) as "a process, through collective efforts, aimed at improving the well-being and self-realisation of people outside urbanised areas ... the ultimate target of rural development is therefore people". As such, the concept of rural development encompasses a whole range of aspects, including those relating to the economic, social and cultural conditions of rural communities. Within this range, various agencies, organisations and authors have attempted to define rural development as it applies to their particular work. The Rural Development Commission, for instance, is "concerned with the well-being of the people who live and work in the countryside" and

aims "to improve the quality of life for rural residents so that the countryside is a place where people both live and work" (RDC, 1996, p.1). Clearly, then, the overriding concern of rural development is people.

Hodge (1986) has also observed that the term 'rural development' is subject to a range of different definitions and interpretations, but in summary may be "defined in terms of an overall improvement in the welfare of rural residents and in the contribution which the rural resource base makes more generally to the welfare of the population as a whole" (Hodge, 1986, p.272-273). In this way, the concept of rural development is expanded somewhat to account for the impacts which activities in the rural realm may ultimately have on the general population, both rural and urban. To this end, Hodge further states that:

> "rural development is concerned with the welfare of rural residents and with policies aimed at improving the potential of rural areas to provide them with satisfactory incomes and access to a broad range of services, and to use rural resources in a manner consistent with the demands of urban residents"
>
> (p.280).

This firmly brings into the debate the issue of the extent to which urban areas are consistently and inequitably empowered over their rural counterparts, but also suggests that quality of life is positively related to income, which is both misleading and over-simplistic. Quality of life is determined by a broad range of factors specific to the individual. These are often inversely or not at all proportionate to income. For example, for some rural entrepreneurs, quality of life is about amenity - working and living in a 'clean' environment, avoiding travel to work and being engaged in a job which is enjoyable. Such factors often incur increased costs and thus run contrary to profit maximization, but are, nevertheless, considered by many entrepreneurs in rural firms to be 'success factors' (Keeble *et al.*, 1992). In a similar vein, Hodge (1986) suggests that Europe's rural areas cannot be considered as independent entities since they tend to be "dominated" by nearby urban areas. He proposes that the traditional problems associated with limited employment opportunities and restricted access to services in rural areas are due to structural adjustment and to the spatial relationship between rural and urban areas.

In practical terms, Murray and Greer (1992), looking at the emergence of rural development policy in Northern Ireland (a peripheral region of the European Union), suggest that integrated rural development strategies should incorporate five main components, all related exclusively to the improvement of conditions in *rural* areas:

> 1. a multi-sectoral approach including improvements in agriculture and promotion of other sectors of the economy as alternatives to declining agricultural employment;
> 2. investment in infrastructure, training and education should accompany economic strategies;
> 3. measures specifically targeted at poor people living in poor areas, matching strategies with their needs and aspirations;
> 4. involvement of target groups in all aspects of the development process from needs assessment to implementation of projects; and
> 5. decentralisation of powers from national to regional and local levels
>
> (pp.173-4).

Here, the most disadvantaged groups in rural society are assigned importance in any rural development strategy. However, there is no explicit acknowledgement of the relationship between rural and urban areas. This represents an important gap since others have repeatedly stressed the fact that rural areas and local economies do not reproduce in isolation, but as part of the whole (Keane, 1997; Saraceno, 1994).

Furthermore, and with relevance to this research, the above definitions of rural development make no reference to ICTs and the role which they might play in improving the conditions of rural residents. This is in stark contrast to many of the statements which have been made by the European Commission regarding the development of rural and peripheral regions of the European Union. The Commission deems the application of ICTs to be an integral part of rural development strategies in many areas.

In summary, however, although there is widespread debate among academic writers concerning the meaning and relevance of 'rurality', definitions of the 'rural' and conceptualizations of 'rural development' abound. Despite the well-documented blurring of some of the distinctions between urban and rural economies, there remain notable

differences between them: accessibility and peripherality among the most significant. Consequently, there *are* important implications for how rural areas will be affected by the implementation of ICTs, as opposed to urban areas where environmental, economic and social circumstances are often significantly different. Considerable volumes of research have examined the effects of ICT implementation in urban areas, but the results of such analyses cannot be directly translated to rural areas. There is thus a strong case for more in-depth research into the application of ICTs in rural areas. Clearly, there are also substantial differences both between and within contemporary rural areas and an effective research methodology must take these variations into account. The rural development impacts of ICT use are likely to vary considerably between rural areas (Hansen *et al.*, 1990; Gillespie *et al.*, 1994) and so too are the implications for rural strategists and policy makers. Some rural areas are poised to benefit from advanced ICTs, while it is likely that, as a result of their particular circumstances, others will not.

The following section addresses the role of ICTs in rural development as perceived by rural planners and policy makers. The spatial variations in the potential and recorded impacts of ICT use on rural development are examined in a review of practical projects implemented at local, national and EU levels.

2.4 The role of Information and Communications Technologies in rural businesses: a vehicle for rural development?

There is particular interest in ICT impacts in rural areas because of their ability to transcend barriers of space and time which are inherent to rural areas. It is thought that the potential of ICTs to promote rural development is heightened because of the changes which have occurred in rural areas in recent years, with many firms having moved to or opened in non-metropolitan areas (Healey & Ilbery, 1985). The fact that rural economies have become less dependent on agriculture and related activities and are more economically diversified means that they are more likely to be affected by the new technologies (Ilbery *et al.*, 1995).

One argument which disputes the extent to which the use of ICTs can benefit rural economies rests on the fact that they are predominated by small and medium-sized enterprises (SMEs) which have traditionally been reluctant to innovate and invest in new technologies for a number of reasons, largely related to resource limitations. This section first examines the characteristics of rural businesses, the particular labour and market conditions within which they operate and their changing role within the wider economy as a result of economic restructuring and the gradual disappearance of the distinctions between rural and urban economies. In terms of their use as a vehicle for rural development, a dialectical argument is then identified. Some authors have argued that ICT use in rural businesses can benefit rural areas economically, while others have disputed this claim, proposing instead that the rural development impacts of the rural business use of ICTs are more likely to be negligible, at best, or even detrimental. The debate is illustrated using examples of projects at local, national and EU level which have employed ICTs as a tool for rural economic development.

Rural businesses: their role in economic growth

Although they vary widely in terms of their characteristics, rural businesses are almost universally SMEs (Keeble *et al.*, 1992; North & Smallbone, 1993; Smallbone *et al.*, 1992). Many definitions of SMEs exist, but it is generally accepted that this group indicates those firms employing up to 200 people. However, in reality, most employ fewer than 50. Small firms are usually considered to be those employing fewer than 20 workers (Storey & Johnson, 1987). Micro-enterprises are those employing fewer than ten people. Other defining characteristics of 'small' firms abound, including annual turnover and net fixed assets, the European Commission's criteria set out in 1991.

Poulson & Jones (1989), in a sectoral study of small rural firms, recognized a need to set different criteria for firm size according to industrial sector. (For example, they suggested that, in the manufacturing sector, small businesses should be defined as those employing up to 200 people while in the motor trades, they might be defined as those with an annual turnover of £365 000 or less (p.91).) Such diversity in definition is also found between different countries and between modern industries and old-line industries (Giaoutzi *et al.*, 1988). The difficulties of small firm definition are compounded by the fact that "small

firms are vast in number and diverse in nature and function (Markusen & Teitz, 1985, p.194).

The UK's population of small firms rose steadily in the 1970s and 1980s. Of the 2.47 million firms in the UK at the end of 1986, 96.4% employed fewer than 20 people; firms employing fewer than 200 people accounted for 99.5% of all firms (Bannock & Daly, 1990, p.256). The extent of small firm growth in the UK is illustrated by Bannock & Daly's research which indicates that the share of firms operating in the UK accounted for by those employing fewer than 20 people increased from 95.2% at the end of 1979 to 96.4% at the end of 1986. Keeble (1990) suggests that this was due to a complex interaction of forces rather than simply, the often cited, recessionary influences. This increase, although occurring throughout the UK and in almost all industrial sectors, was subject to both regional and sectoral variations. The south west, south east and East Anglia experienced the most appreciable growth (Mason, 1989; Storey & Johnson, 1987). Analysis of VAT business registration statistics shows that small firms in the financial and professional services sector rose by 86% and in 'other services' by 100%, while those in the production sector experienced a mere 28% increase (Hughes, 1991).

However, one of the most striking disparities in small firm growth is apparent between urban and rural areas. Growth in small firms and in new firms has been greatest in the more remote and peripheral areas of the UK (Storey, 1985). This has been enhanced as a result of population in-migration to rural areas (North & Smallbone, 1993). Much research on small firms has focused on the variation between urban and rural firms concerning, among other aspects, their rates of growth, their levels of turnover and their propensity to generate employment and thereby promote economic development. Research indicates that there is a tendency for these aspects to vary by region, but that this regional variation is underpinned by an urban-rural disparity. North & Smallbone (1993) have shown that SMEs in rural (particularly remote rural) areas have out-performed their urban counterparts in this respect.

A comparative study by Smallbone *et al.* (1992) highlighted a number of differences between rural and London-based firms. In terms of product, rural firms were more

oriented towards craft-type activities (for example, furniture making and printing) while very few were involved in electronics and hi-tech activities in comparison to the London firms. This was in part due to the fact that the rural firms in the sample were mainly mature; hi-tech production is more likely to be found in newer firms in rural areas. In addition, the rural firms were found to be younger, on average, than those based in London. Importantly, the study indicated that fewer of the rural firms grew large enough to attain a size considered to be necessary to ensure a prosperous future. Rural firms were, however, found to be more innovative in their product and market adjustment and more actively looking for new, geographically distant markets. Relocation was also a more common strategy among rural firms.

Keeble (1990) suggested that five major causal mechanisms operate in the stimulation of new and small firm growth:

1. 'recession-push' mechanisms (including forced entrepreneurship with rising unemployment and rationalization);
2. fragmentation strategies of large firms and sub-contracting within them;
3. the growth in personal disposable income and the associated growth in demand for increasingly specialized and customized goods;
4. levels of technological change; and
5. government small firm policies and the emergence of 'enterprise culture'.

This view is supported by the work of Mason & Harrison (1990), categorizing these mechanisms as:

- *causal factors* (recession-related explanations, technological change and structural change) and
- *facilitating factors* (the 'enterprise climate' of the 1980s and enhanced resource availability - i.e. in terms of advice, training, finance).

One factor implicated in the recent upsurge in the numbers of new and small businesses in the countryside is that the entrepreneurial propensity in rural areas tends to be greater than in urban areas (Bryant, 1989; Keeble *et al.*, 1992). Bryant (1989) suggests, however, that the role of the entrepreneur in sustaining the vitality of rural areas has long been

understated, being superceded by the notion that external influences (particularly from urban quarters) are the main factor inducing change in the countryside; that is, rural areas are reactors to change and, as such, undergo passive change. He defines an entrepreneur as "a decision-taker who can identify an opportunity, assemble the necessary factors of production and resources, and transform an idea into a marketable product or service" (1989, p.340). He stresses that the role of the entrepreneur means going beyond what one can directly control, taking risks and using initiative. Looking at the role of such individuals in rural economic development initiatives, Bryant highlights the need for both individuals who will take on a leadership role and the determination of the community as a whole to induce change. In the context of a study of small businesses in rural Ontario, he found that the community creates an *enabling environment* in which entrepreneurs may encourage change and, hence, development.

Recent studies of UK rural businesses have shown entrepreneurial propensity to be comparatively high in some rural areas. For example, Gillespie *et al.* (1994), in researching the potential of rural Scotland to benefit from new telecommunications developments, found that "rurality, in the Scottish context at least, is strongly associated with entrepreneurial potential" (p.208). The research used factor analysis to identify those characteristics of local areas throughout Scotland which varied most significantly and might therefore be used to develop variables which could predict the potential of telecommunications to play a role in local economic development. The factors which distinguished most clearly between local areas were 'rural entrepreneurship', 'information professionals' and 'metropolitan connectivity'. The geography of these factors, however, differs considerably. Levels of entrepreneurship were highest in remote rural areas while the preponderance of information professionals was greatest in more accessible or "tamed" rural areas and in the suburbs of the major cities (Gillespie *et al.*, 1994, p.208).

Other studies have shown entrepreneurial propensity to be closely related to rates of new firm formation and to be more prevalent in accessible rural areas than in urban or remote rural areas (Keeble *et al.*, 1992; North & Smallbone, 1993 & 1996). However, according to some research, this entrepreneurialism is largely due to in-migrants into rural areas, which perhaps partly explains why it is more intense in accessible rural areas. Keeble *et*

al. (1992) found that, although 84% of remote rural firms and 85% of accessible rural firms were founded locally, a high proportion of firm founders were in-migrants from elsewhere - 66% of new firm founders in accessible rural areas and 58% of those in remote rural areas. These figures compare with only 35% in urban areas (p.14). In one fifth of firms surveyed in remote rural areas, the founder had moved there specifically to set up the business. Keeble *et al.* suggest that "this considerable migration flow of actual or potential business entrepreneurs to the countryside" is likely to be underlain by "the perceived environmental attractiveness of England's villages and rural areas as a place to live" (p.14). This assertion is supported by the fact that four fifths of migrant firm founders in remote rural areas and three quarters of those in accessible rural areas cited environmental attractiveness as of some or great importance in their move to a rural area. In addition, in terms of the choice of company location, environmental reasons also featured very highly in both remote and accessible rural areas (respectively ranked third and fourth out of eleven factors) (p.15).

However, Smallbone *et al.*'s comparative study between rural and London-based mature manufacturing SMEs suggested, on the contrary, that there was

> "little indication ... of entrepreneurs moving to rural areas in order to set up their business. The founders of three quarters of the [rural] firms ... lived and worked in the area previously, suggesting that the main source of new rural businesses is to be found in the local rural economy and not from outside."
>
> (Smallbone et al., 1992, p.5.)

There would thus appear to be no clear consensus amongst researchers as to the true origin and extent of rural entrepreneurialism. However, one aspect of the rural business literature in which there is agreement is that concerning rates of new firm formation. This was consistently higher in rural areas than urban areas during the 1980s (North & Smallbone, 1993) and has important ramifications. One of the most important in terms of rural development is employment generation and this too is an issue which is "hotly debated" (Keeble, 1990, p.238). The notion that small firms generate a disproportionately higher number of jobs in comparison to large firms is widely accepted and, during the early 1980s, when larger firms were shedding labour in vast quantities, the new and small firms

were increasing their contribution to the labour market (Bannock, 1986; Keeble, 1990; Mason & Harrison, 1990). Many authors agree on this point; however, estimates of the actual numbers of jobs created vary widely. Storey & Johnson (1987b) estimate that more than 210 000 jobs were created in the UK's small firms between 1982 and 1984, while a much higher figure (600 000) has been suggested by Doyle & Gallagher (1987. Cited in Keeble, 1990.).

The spread of job creation is uneven, however, with more than 70% of all new jobs in mature manufacturing SMEs in the 1979 to 1990 period being created in only 23% of firms (North *et al.*, 1993). The propensity of small firms to create jobs also varies geographically; those in rural areas have been shown to generate proportionately more jobs than similar firms in urban areas. Keeble *et al.* (1992) found that employment in remote rural firms had grown faster, on average, than that in accessible rural firms, while in urban firms, employment had fallen. However, Storey & Johnson (1987) suggest that, although small businesses make an increasingly significant contribution to job generation, this is still modest and does not represent a solution to unemployment.

Nevertheless, Smallbone *et al.*'s 1992 comparative study of rural and London firms found a net increase in employment in rural firms of 51% over the decade, compared with only 7% in London firms. In both sets of firms, this was largely due to employment increase in the firms which had doubled their turnover, and supports the findings of other similar work (for example, Storey & Johnson, 1987; North *et al.*, 1993). In addition, the majority of jobs were created as a result of the expansion of established SMEs rather than the growth of younger firms. However, it is of note that 59% of the rural firms increased their employment over the decade as opposed to 45% of the London firms. European Union policy favours small firms in creating employment opportunities, considering them essential to sustainable job creation. Thus SMEs have come to underpin many of the EU's economic development strategies. Some of those which are linked to ICTs are discussed in more detail in section 2.5.

In addition to the question of simply how many jobs are generated within small firms, there is also the issue of the quality of this employment. It has been suggested that jobs

created in small firms are of inferior quality in that they offer poorer working conditions, fewer benefits and lower wages than in many larger companies (Storey & Johnson, 1987). This is partly a result of the nature of activities in which smaller firms become involved; most small firms are in the service sector in which many more jobs are part-time and there is a relatively high proportion of female labour (Stanworth & Gray, 1991). There is concern in some quarters that the poorer quality of employment inherent within small firms has worrying implications for economic development. Sengenberger & Loveman (1988. Cited in Mason & Harrison, 1990, p.84.) claim that lower wages, fewer fringe benefits, lower security and health standards, inferior job security and longer working hours associated with small firms, coupled with low unionization among small firm employees, mean that the current shift towards smaller businesses could result in the decline of employment standards, social welfare and industrial relations, thus adversely affecting economic development.

The preponderance of small firms in rural areas, in turn, suggests that this issue has a particular resonance with rural development. The potential impact may be further heightened by the influence of ICTs on working practices. For example, teleworking may, in fact, exploit part-time female labour available in the countryside, as it is often associated with low skilled, low paid, back-office functions, and irregular, short-term contractual arrangements. Coupled with isolation, these factors can lead to low morale and insecure income, which affect both social and economic development in rural areas, not least because they perpetuate the dependency of rural areas and their residents on urban core regions. This is particularly the case with exclusively home-based teleworking which is most likely to be carried out in peripheral rural areas. This type of teleworking is "typically carried out by women workers, who are paid by results, and is therefore frequently both low paid and precarious" (Rural Development Commission, 1996e, p.1).

It is widely recognized that *rural* firms face particular problems and constraints which are unique to them. These are mainly related to finance, premises and communications, and access to services, markets and suppliers (Keeble *et al.*, 1992; North & Smallbone, 1993; Poulson & Jones, 1989). However, many of their problems are generic and apply to all *small* firms, whether urban or rural. Poulson & Jones (1989) found three major problem

areas among businesses in rural Wales: finance, bureaucracy and premises. Shortages of skilled labour and scarce management and technical expertise are especially problematic for remote rural firms. Furthermore, while the availability and cost of premises for start-up firms may be favourable in many rural areas, evidence suggests that there is a dearth of premises able to accommodate expanding firms (North & Smallbone, 1993). Since research has shown that expansion of existing firms holds the key to employment generation, this represents a significant barrier to economic development in rural areas.

Clearly, there exists a substantial body of research concerned with small firms, some of which has examined specifically the characteristics of those located in rural areas, often in comparison with urban firms. However, this research has been concerned mainly with objective, measurable aspects, largely overlooking the less tangible matter of the processes operating within the firms themselves, which lead to these spatially differentiated patterns of growth, decline and employment generation; explanation has been sought in macro-economic factors, such as the prevailing climate created by national government policy. There is no doubt that these factors are of considerable importance. However, it is highly probable that their effects will be influenced by what is going on within the firm. Furthermore, the role of ICTs is of increasing importance in the rural business arena and thus justifies specific research.

The following section considers work which has examined this role, highlighting the potential benefits and disbenefits for rural areas and illustrating the merits of a research process which explores further the relationships between the use of ICTs within rural businesses and the associated rural development impacts.

The implementation of ICTs in rural businesses as a rural development tool

Researchers in this field have long debated the possible outcomes or impacts of ICT adoption and use within rural businesses, both for the businesses themselves and for the wider communities in which they operate. This debate has progressively become much more sceptical of the formerly held view that ICTs were the answer to all the problems of rural and peripheral areas. The benefits and disbenefits are well-documented and are

summarized below, followed by an examination of the findings of some of the research carried out to date on the extent and impacts of ICT uptake in rural firms.

Principally, the argument in support of the business use of ICTs as a development tool rests on the exploitation of the spatial nature of their potential impacts.

> "Economic development is highly uneven; ICTs, because of their inherently spatial characteristics, are potentially potent forces in the process of uneven development, particularly through their influence on the location of employment opportunities."
>
> (Goddard, 1994, p.274)

Several pieces of research have examined the uptake of telematics among rural SMEs and postulated the means by which this uptake might affect rural economies. Ilbery *et al.* (1995, p.58) suggest that ICTs could, theoretically, encourage long-term rural development through:

1. "overcoming the traditional barriers of time and distance, thus improving access to national and international markets and increasing the competitiveness of rural firms;
2. reducing communication costs and the costs of information transfer between locations, thus increasing locational flexibility;
3. simplifying and improving the efficiency and effectiveness of internal business and management functions;
4. increasing co-operation with other rural firms by encouraging a networking culture; and
5. bringing rural firms 'nearer' to the major decision-makers located in core areas."

There is also a body of literature, however, which suggests that ICTs may have detrimental effects on rural communities and their development in both social and economic terms. As Grimes (1992) points out, there is a danger that, due to the fact that the diffusion of information technology is associated with urban nodes, and therefore most of the potential related development impacts would also be likely to become concentrated in the cities and their environs, the dominance of the core areas over the periphery is likely to be enhanced. Grimes describes this potential effect of ICT adoption as "the threat of *telecolonialism*" and suggests that the market potential of peripheral areas might be drained through

exploitation by those in the core and through the low-paid and insecure nature of employment which is provided on a teleworking basis (p.272 - emphasis added).

Gillespie *et al.* (1994) refer to the 'double-edged' effect of the implementation of ICTs on rural businesses and communities. Citing the example of electronic transactions from a study for the European Commission by Price Waterhouse (1990), they note that, although such services could benefit rural people, by providing low-cost access to a variety of products and services, they could also lead to job losses as a result of increased competition for rural retailers from suppliers based in core areas, and by causing the closure of rural branches of banks which would no longer need to provide such a wide range of services. They warn that "removing the barrier of distance works both ways ... in some cases undermining local businesses by exposing them to more efficient external competitors" (p.202).

There is much speculation in the literature to support these fears, with particular concern over the lack of service provision in rural and peripheral areas. For instance, Bryden *et al.* (1996, p.11) note that, due to the fact that "some regions in some countries", in particular rural areas, lack connections to the advanced telecommunications networks necessary to carry advanced ICTs, there will be extreme inequality in the apportioning of benefits to be gained from the new technologies, with rural areas being those most likely to lose out. The deregulation of telecommunications infrastructure and service providers also has implications for more sparsely populated areas and, hence, poses a threat to rural areas which may suffer due to a reluctance by such providers to invest in areas where demand is relatively low and spatially dispersed. An additional prevailing concern expressed by various authors over the negative impacts which may be suffered by rural areas as a result of the increasing adoption of ICTs relates to the types of work associated with their use, particularly in rural areas. Processes of globalization and economic restructuring have led to the contracting out to peripheral regions and countries of low-skilled and low-paid labour. This out-sourcing of so-called 'back-office functions' such as database maintenance and dispatch has reinforced the restructuring of rural labour markets which have seen a decline in traditional full-time jobs, particularly in agriculture, and a growth in part-time and seasonal work. New employment creation in rural areas in the last decade

has tended to comprise low-paid work, largely for women, and this has been facilitated by the rise in the adoption of teleworking by larger companies located in the core, thus reinforcing the threat of exploitation of the periphery by the core (Bryden *et al.*,1996; Grimes, 1992; Ilbery *et al.*, 1995; Richardson *et al.*, 1995).

A recent Europe-wide survey of telematics use in rural businesses yielded some interesting results. The SARBA project (Services and Applications for Rural Business Activities) focused on seven contrasting rural regions of the EU, in Greece, Spain, Germany and the UK (Ilbery *et al.*, 1995). More than 18 000 non-agricultural businesses were surveyed extensively to explore a range of business characteristics and patterns of telematics uptake. Intensive research methods were used to explore in more depth factors such as business problems and opportunities, current and potential uses of telematics and issues related to rurality. While telephones and fax machines were abundant, ownership of more advanced telematics was very low and types of use were generally primitive. In other words, the technology which was present was often severely underused. The results showed considerable spatial variation in generally low levels of ICT use. For instance, computer ownership ranged from 42% in Germany to only 15% in Greece. Telematics services were used by even fewer firms, ranging from 12% of those in Germany to 17% in Spain. The researchers postulated that low levels of telematics uptake may be due to a lack of awareness of their potential business benefits, financial constraints in a period of recession, and poor training provision.

In-depth research showed rural SMEs to be faced with four major problems: cashflow, marketing, recruitment of qualified staff and IT support. Ilbery *et al.* suggest that these might present scope for telematics applications. However, as the results of the extensive survey show, these opportunities are not being realized. This was found to be largely due to 'user-resistance' or 'technophobia'. There is still a considerable gap between the vision of software developers and the practical needs of businesses. Put simply, "rather than a wonderful solution searching for a problem, developers of telematics applications and services must respond to immediate problems or opportunities for these businesses" (Ilbery *et al.*, 1995, p.66). Suggestions are made as to the routes down which policy makers might go if their wish is to promote telematics uptake among rural firms. However, there is no

empirical investigation of either the intangible reasons for the levels of ICT uptake detected, or of the agency/strategist side of the equation. If the processes operating are to be fully understood, the perspectives of those in the business of promoting rural development must also be taken into account. The following section reviews the impacts of ICT-related policies which have been put into practice. However, to date, there is no research which has fully investigated both these aspects (i.e. the inner workings of the firm and the external forces exerted by agencies and policy makers) with respect to the rural business environment.

2.5 Implementation of ICT-related policies

Interest in the role of the business use of ICTs in rural development is not only a question of academic importance, but is also of concern in terms of its practical implications for policy. As mentioned in section 2.2, many policy makers at various geographical levels, from local to regional to supra-national, have sought to use ICTs as a vehicle for promoting regional and rural development. This section explores the ways in which these perceptions have been implemented in practice.

As a result of the way in which new technologies are diffused through the economy, ICTs have traditionally been a core area/urban centre phenomenon. The range of services available in most rural areas is still more restricted than in urban regions (RDC, 1989). One of the key issues for policy makers is how the continuing development of advanced telematics can encourage "greater economic integration between core and peripheral areas" (Ilbery *et al.*, 1995, p.58). Certainly, the concern over the heterogeneity of rural areas must be taken into account (Keeble, 1990). Millard (1993) suggests that there are two main approaches usually adopted by policy makers in this respect: one being the cautious approach, calling for progress to be kept at a gradual pace with simple technology which is entirely demand-led; the other involving huge investment in state of the art technologies up front. Millard points out that both approaches may be valid in different types of rural area, but that, in using telematics as a development tool, the uniqueness of rural places must be recognized while still retaining the ability to draw upon experience gained in areas presenting similar problems and opportunities.

Melody (1985) has advised caution in terms of social policy and ICTs, suggesting that it will be essential that ways can be found to ensure that developments in the information and communications sector do not intensify class divisions in society and that the benefits are spread equitably across all societal groups. It is therefore clear that policy makers must be aware of the possible impacts of ICTs on both the economy and society as a whole and must take a proactive role in the emerging Information Society in order that the threat of increased marginalization of minority and disadvantaged groups is not manifested. This point is reiterated by Goddard & Gillespie (1986, p.384) who advise that

> "developments in the information economy and in the use of new technologies that articulate that economy, are likely, without policy intervention, to exacerbate geographical divisions and to make worse geographical disparities in economic well-being. In the interests of equity and efficiency, it is important to ensure that the opportunities associated with the information economy are shared between the different cities and regions which make up our society."

The notion that rural development may be promoted via the vehicle of ICT use in SMEs is based upon the premise that their use can benefit firms in terms of efficiency, profitability and competitiveness, as well as improving connectivity with distant suppliers and markets. It is believed that these advantages will be accompanied by further positive economic and social implications for communities in rural areas. Such views are generally supported by the body of literature on ICTs and regional economic development, and "it is increasingly recognised that telecommunications technologies are the 'competitive weapons' upon which the competitiveness of firms and the comparative advantage of regions will critically depend" (Capello and Nijkamp, 1996, p.7).

Certainly the European Commission has positively encouraged ICT adoption and use, particularly in lagging or peripheral regions of the European Union (EU), funding many projects to improve the necessary infrastructure on an EU-wide scale. Many of these projects have been targeted at SMEs since it is widely believed by policy makers that it is this sector of the economy in which most growth can be expected to occur within an 'Information Society' (Richardson & Gillespie, 1996). This holds particular importance for rural areas, since it is firms in this smaller size range which predominate. Among the

European strategies to promote ICT use, the ORA (Opportunities for Rural Areas) programme funded projects such as SARBA (Services and Applications for Rural Business Activities) to identify telematics systems appropriate to rural SMEs as a strategy to promote rural development (Ilbery *et al.*, 1995). Other such projects include RUNES (Rural Networking for European SMEs), BIRD (Better Infrastructure for Rural Development), Télématique and STAR.

In December 1993 the European Commission published a White Paper on "growth, competitiveness and employment" which suggested that telematics could play a major role in promoting sustainable economic growth throughout Europe. In the following year, the Bangemann Report set out recommendations to facilitate this role, including the deregulation of the European communications market and large-scale investment in network infrastructure (TURA, 1995a). The monopoly communications providers have been replaced by a complex mix of competing suppliers and policy makers. A significant proportion of the extensive range of projects and programmes since instigated by the European Commission have particular relevance for peripheral and rural areas. The relative success of some of these programmes in satisfying their required objectives of rural development are now examined, highlighting their implications for this research. Table 2.1 shows a fraction of the plethora of projects devoted to ICT implementation in rural areas.

Table 2.1 European projects related to ICT implementation in rural areas

Project title	Description
BIRD	Better Infrastructure for Rural Development
FORA	Forum for Opportunities in Rural Areas
MITRE	Market Implementation of Teleworking in Rural Environments
ORA	Opportunities for Rural Areas *(programme)*
SABRE	Support for Applications of Businesses in the Rural Environment
SARBA	Services and Applications for Rural Business Activities
STAR	Special Telecommunications Action for Regional Development *(programme)*
RADIO	Rural Area Delivery of Information and Organization
RUNES	Rural Networking for European SMEs
RUROTEL	Telematics Applications for Tourism and Leisure in Rural Areas
TAP	Telematics Applications Programme *(research programme)*
TURA	Telematics for Urban and Rural Areas

The STAR programme was typical of early policy implementation which followed a technologically deterministic or 'infrastructuralist' approach (Richardson & Gillespie, 1996). Its primary objective was to use advanced communications to assist economic development in peripheral regions of the Community. This was to be accomplished largely by funding the provision of advanced infrastructure, particularly digital networks (Lalor, 1987). However, problems experienced in encouraging technology adoption in peripheral areas have led to the realization that it is not simply a lack of infrastructure in rural areas which slows the diffusion of IT, but a lack of demand for associated services (Grimes, 1992).

The model upon which such projects were based had two major failings. Firstly, SMEs have been shown to be slow to take up advanced telecommunications technology; and secondly, the reality of conditions external to the business (such as the linkages between core and periphery) is largely ignored. If peripheral firms are to become integrated within core markets through the use of advanced telecommunications, they must have competitive skills and existing networks within which to market their specific competencies or products (Richardson & Gillespie, 1996). The Télématique programme, which followed STAR, thus focused on stimulating demand for existing infrastructure by encouraging the

development of telematics services appropriate to the needs of SMEs. Research carried out under the SARBA project also sought to identify relevant telematics services for SMEs by first examining the specific problems which apply to rural businesses and then designing applications of telematics to overcome these (Ilbery *et al.*, 1995).

In the UK, the ESRC's Programme on Information and Communications Technologies (PICT) is a national research programme based at six universities. Launched in the mid-1980s in an attempt to inform the debate on the potential impacts of the information revolution, the programme "is now well placed to offer a realistic perspective on the opportunities and risks afforded by IT" (Mansell, 1994, p.ix). Most recently, the UK government, through the Department of Trade and Industry (DTI), instigated the Information Society Initiative (ISI) to help develop awareness of the benefits of new information and communications technologies, particularly amongst small businesses, community and voluntary organizations and the general public. The main aims of the ISI are to safeguard against the exclusion of traditionally marginalized groups and to promote and maintain the competitiveness of the national labour market in the global arena. The strategy is currently being delivered through agencies such as the Business Links, the TECs and further education establishments and via media campaigns.

Increasingly, local economic development agencies and authorities in the UK are implementing ICTs as a major strategic intervention tool. One of the first examples of such policy intervention in ICT infrastructure provision is that of the Highlands and Islands Telecommunications Initiative, set up in Scotland in 1989. The region comes under the European Commission's Objective 1 designation - i.e. it is economically one of the weakest European regions. As a remote, peripheral region, the Highlands and Islands suffers from problems such as distant markets, an undiversified economic and industrial structure, a shortage of skills and the means to develop them, and high levels of out-migration, particularly of those in the 20 - 44 age range. In a bid to avoid the region being left behind in the gradual process of infrastructure installation nationally, the Highlands and Islands Development Board and British Telecom together established the initiative in 1989 to upgrade the region's telephone exchanges to ISDN. By 1982, around 80% of businesses were reported to be able to access ISDN. However, Richardson & Gillespie's

research suggests that access to ISDN "is having very little impact on small and medium-sized firms in the region" and that, overall, "the Initiative has had a limited impact in the region's existing firms, and ... made little contribution to their viability (1996, p.99). Instead, employment generation which has occurred has been as a result of micro- and small businesses established by incomers who have the necessary skills to exploit the infrastructure provision to their advantage. Richardson & Gillespie suggest that this represents an "awareness gap", whereby indigenous firms have neither the appropriate knowledge nor the skills to use the available technology to access core and distant markets. This poses a threat to the long-term sustainability of some rural and peripheral regions and requires a very targeted approach to ICT awareness-raising activities delivered by agencies responsible for promoting local economic development.

To date, research into the impacts of ICT implementation in rural areas has concentrated heavily on the businesses through which projects are delivered and, as such, has largely failed to take into account the agency perspective. Little is known about the views of agencies regarding the potential benefits and risks associated with ICTs, nor of the reasons why they do or do not choose to employ ICTs in their overall development strategies. Furthermore, factors such as their own use and knowledge of advanced ICTs and the extent of their influence on the businesses in question may have important implications for the speed of the diffusion process among rural SMEs and are not well-researched.

2.6 Implications for research directions

This chapter has shown that, because of the uncertainty surrounding the impacts of ICT use in rural areas for rural development, there is a need for empirical research to throw light on the wider debate. This review has identified gaps in the existing literature on ICT impacts in rural areas. In particular, there is a need for a more in-depth understanding of the ways in which rural SMEs adopt and use these technologies. Linked to this, there is a need to understand how rural development agencies perceive this uptake and use of ICTs and how they respond to it in practical terms.

In the light of such precautionary notes in the existing literature, it is critical that the external agency sector be examined to evaluate the current thinking which prevails within

the sector regarding the levels of ICT adoption and use among rural firms and the impacts which this penetration of ICTs is having, and is likely to have, on rural economies and societies as a whole. In addition, the importance attached to this phenomenon by agencies in terms of their activities must be examined in order to assess whether or not a specific rural development policy exists and the extent to which the provision of information on ICTs and the promotion of their use is part of this.

Having reviewed the literature and identified the areas of research which need to be supplemented, the following chapter develops a conceptualization of the research problem. The perspective adopted takes into account the degree of complexity which is involved in ICT uptake in rural businesses.

Chapter 3

CONCEPTUALIZING THE IMPLICATIONS OF INFORMATION AND COMMUNICATIONS TECHNOLOGIES FOR RURAL DEVELOPMENT

3.1 Introduction

The previous chapter highlighted the technologically deterministic nature of much of the previous literature on the impacts of Information and Communications Technologies (ICTs). The review of the literature on ICTs suggested that the theoretical advancement of this field of study has been impeded by inappropriate conceptualization; this relates to the lack of recognition of the importance of entrepreneurial behaviour in the process of ICT adoption in rural businesses. This research seeks to redress the balance by adopting an approach which draws largely on *humanistic behavioural* perspectives. This approach recognizes the importance of both *the individual* and *the wider context within which innovation/adoption decisions are made* in the process of ICT adoption and thus in the wider implications of this process.

In order to investigate the uptake of ICTs in rural businesses, and the potential implications of these technologies for rural development, it is first necessary to formulate a conceptualization of the various processes and relationships involved. The field of ICTs and rural development is one which is particularly deficient in theoretical work. The bulk of writing in this field has been theoretically näive; the mainly empirically-driven research conducted under European Union programmes exemplifies this fact. There has been very little conceptualization of the processes involved in the adoption and diffusion of ICTs beyond the level of consultancy work and a great deal of speculation. This research seeks to contribute theoretically to the literature by adding to the subject a degree of conceptual depth.

It is the purpose of this chapter to critically review the development of theory in the field of ICT impacts[1] and to develop a conceptual framework for the research. First, an

[1]The term *ICT impacts*, introduced in this chapter, denotes the effects which the use of ICTs may have on the user and on the environment in which the user operates. For the purposes of this research this constitutes the

overview of conceptualization in rural geography in the latter half of this century examines the succession from positivism, through humanism, to the more radical responses of recent years, such as structuralism, realism and post-modernism. Secondly, the process of decision-making and adoption of ICTs is conceptualized, suggesting that a detailed understanding of the uptake, use and implications of ICTs is best achieved by adopting a humanistic behavioural perspective which also recognizes the importance of the influence of the wider economic system. In conclusion, the chapter illustrates briefly the way in which the research methodology is designed on the basis of the proposed conceptual framework. This methodology is further developed in Chapter 4.

3.2 Approaches to the study of ICT impacts

It has been commented that the existing body of literature on ICT impacts is "rarely placed within a well-developed theoretical context" (Gibbs & Tanner, 1997, p.29). Those researchers who have attempted to approach the question of the impacts of ICTs on rural development from a theoretical stand-point have, for the most part, adopted an 'information economy' perspective. This is essentially a technologically deterministic point of view. Some attempts have been made to follow other schools of thought, including positivism, behavioural positivism, structuralism, political economy and regulation theory, but these remain in the minority. This section reviews the conceptualizations of previous researchers in the field, concluding that there is a need for a new perspective which can incorporate and take account of both the behavioural characteristics of decision-makers and the opportunities and constraints imposed upon them by external factors.

Before examining the progression of theory within the subject of ICTs and rural development, it is appropriate to review in brief the development of theoretical perspectives in the sub-discipline of rural geography. It was Halford Mackinder who first introduced geography as an academic subject at the close of the nineteenth century and, even at that time, suggested that geography needed to be identifiable, both in its methods

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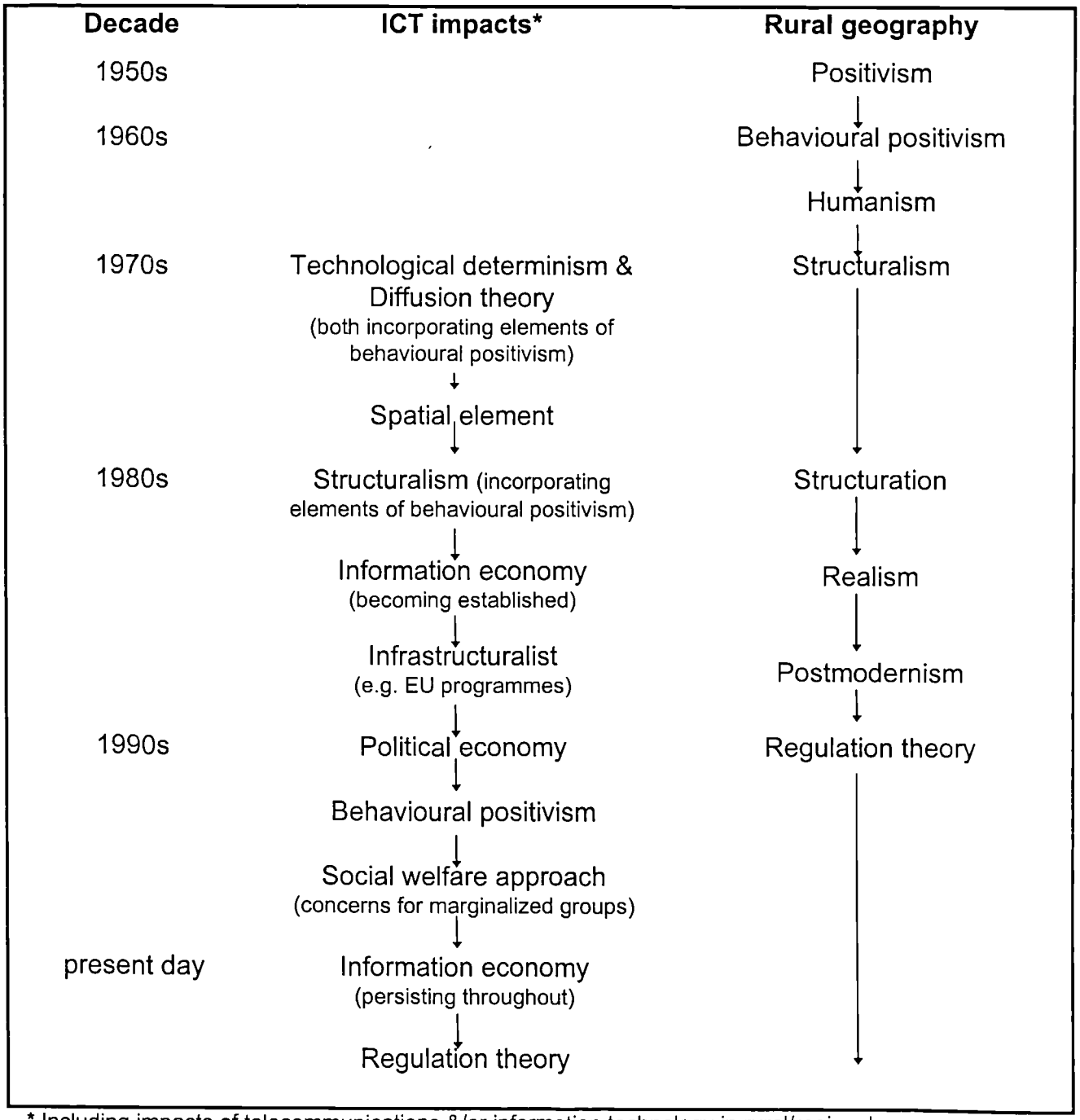
firm and the local rural area within which the firm is situated. It is important to recognize that ICTs themselves cannot produce impacts. It is the nature of their application in the business environment which creates impacts both within the firm itself and external to it. There is a growing literature on ICT impacts and how they can be assessed. ICT impacts in the study area are discussed in detail in chapters 6 and 7.

and in its role within the outside world (Cloke *et al*, 1991, p.3). This view paved the way for the great debate about theoretical approaches. With regards to the study of rural geography, this debate was relatively slow to take off (partly due to the fact that this is a comparatively young sub-discipline (Cloke, 1989)), but has intensified throughout the latter half of this century. A succession of prevailing philosophies[2] has dominated at different times throughout the last fifty years. The first of these is the positivist (or neo-classical) approach which was the accepted mode of study up until the late 1960s, when, as a reaction to the failings of this perspective, views shifted towards a more behavioural and, subsequently, humanistic approach. In turn, this was replaced in the 1970s by a structuralist approach which was later modified by realists and structurationists and subsequently contested by postmodernists in the 1980s and early 1990s (Cloke *et al*, 1991; Eyles & Smith, 1988; Healey & Ilbery, 1990; Johnston, 1986a & 1986b).

In the ICT impacts literature, there has been noticeably less conceptual progress than might have been expected (Gibbs & Tanner, 1997; Goddard, 1994; Graham & Marvin, 1996), particularly given the high level of general interest which has been shown towards this field of study in recent years. In the study of a commodity which is changing so rapidly, such conceptual sluggishness is at the very least unexpected, particularly given the level of philosophical activity and debate which has emerged in other geographical sub-disciplines such as rural geography. However, there is evidence of conceptual development in more recent work on ICT impacts. This has been driven, firstly, by the changing nature of the technologies themselves (and more specifically their growing availability) which has antiquated older, more technologically deterministic, approaches to the field; and secondly, by the external forces of an explosion in conceptual development in the wider field of rural geography. Figure 3.1 shows how this evolution of theoretical perspectives in the ICT impacts literature contrasts with that which has characterized rural geography.

[2] For full definitions of those philosophies referred to in this chapter, see the Glossary of Philosophical terms.

Figure 3.1 Evolution of theoretical perspectives



* Including impacts of telecommunications &/or information technology in rural/regional development.

It is important to note, however, that most approaches developed in both fields of study have tended to persist even when superseded by newer ideas. For example, in the ICT impacts literature, although elements of structuralism first started to appear in research methodologies in the early 1980s, they still remain important in much of the current work. In other words, there is a gradual build-up of conceptual diversity rather than a succession of used and then discarded approaches (theoretical *evolution* rather than *revolution*). In

this way, theoretical perspectives are gradually becoming more integrated and holistic in their treatment of methodological issues.

The comparative lack of empirical research into the impacts of ICT use has already been mentioned. Table 3.1 illustrates the themes which have emerged in those empirical studies which have been conducted. Table 3.2 represents themes emerging in literary reviews on ICT impacts.

Table 3.1 Theoretical approaches and research themes in empirical studies of the geography of ICT impacts*

Theoretical approaches highlighted	Examples of themes covered	Examples from the literature
Technological determinism	impacts of rural travel	Clark & Unwin (1980)
	role of technology in industrial change - implications for regional policy	Rothwell (1982)
Diffusion theory	ICTs and office location	Goddard & Pye (1977)
Positivism	dispersal of hi-tech strategies as a regional development strategy	Lipshitz (1993)
Positivist behaviouralism	assessing the potential for ICT uptake in rural areas through an extensive survey of rural businesses	CLED (1993) Clark *et al.* (1995) Ilbery *et al.* (1995) Berkeley *et al.* (1996)
	analysis of ICT impacts on firm decision-making processes through measurement of network externalities in the telecommunications sector	Capello & Nijkamp (1996)
Structuralism	investigation of structural constraints on ICT uptake through extensive survey	Gillespie *et al.* (1994)
Political economy	the role of the state in spatial differentiation of telecommunications and rural development effects	Gillespie *et al.* (1991)
	role of political economy in effects of ICTs on industrial change	Dabinett & Graham (1994)
Regulation theory	interview survey of UK local authorities on reasons for incorporating ICTs in local economic development strategies	Gibbs & Tanner (1995)
Humanistic behaviouralism	postal & interview surveys with private & public sector road freight transport operators to study relevance & use of ICTs as strategic tools in the road transport sector	Nijkamp & Pepping (1996)
	postal & interview surveys of firms & public sector actors in an ICT initiative to study ICT use	Richardson & Gillespie (1996)

* Including impacts of telecommunications &/or information technology in rural/regional development.

Table 3.2 Theoretical approaches and research themes in the literature reviewing the geographical impacts of ICTs

Theoretical approaches highlighted	Examples of themes covered	Examples from the literature
Diffusion theory	technological change and regional development	Oakey *et al.* (1982)
Structuralism	telecommunications and regional economic development	Goddard & Gillespie (1986)
	telecommunications and development of Europe's less favoured regions	Gillespie (1987)
	using ICTs for rural development	Grimes (1992)
	barriers to information and communication networks	Suarez-Villa *et al.* (1992)
Challenging technological determinism	ICTs and the geography of magazine print publishing	Driver & Gillespie (1993)
Social welfare	telematics trials to raise quality of life indicators in a rural area	Gant (1994)
Political economy	telematics in urban policy	Graham (1994)
Information economy	telecommunications and regional comparative advantage	Gillespie & Williams (1988)
	geography of the information economy	Hepworth (1989)
	geography of the information economy in the UK	Goddard (1991)
Regulation theory	regulation theory and uneven development	Peck & Tickell (1992)
	ICTs, local economies and regulation theory	Gibbs & Tanner (1997)

The tables indicate the limited development of theory in ICT impacts research. Most notable is the scarcity of humanistic work and of research which follows more recent radical perspectives such as realism, structuration or postmodernism. This may be due to the comparative scarcity of empirical work in the field as a whole and, linked to this, the fact that it is a relatively new area of research.

In examining ICT impacts, the emphasis of enquiry will necessarily be on problems of uptake and use. Where these are concerned, some research questions such as that of availability of ICTs have become virtually redundant, in that the necessary infrastructure is now almost ubiquitous in advanced capitalist economies. Where levels of uptake (and hence spatial impact) are concerned, those factors which are internal to the firm itself are increasingly likely to be influential. Within the framework of this study, where the majority of firms are very small, these internal factors (besides those which are related to financial resource availability) are predominantly those pertaining to entrepreneurial characteristics; in other words, human factors such as attitudes, goals, values, technological awareness, information skills levels and personal resistance to technology (or

'technophobia'). In these small firms it is largely the personal characteristics of owners, proprietors and managing directors that hold the key to determining both the types of technologies taken up and the extent of this adoption.

It is, however, still important to recognize the opportunities and constraints presented by the external forces acting in the wider economy and the prevailing mode of production. The role played by institutions, agencies and suppliers, in particular, should not be understated. The contextual importance of such factors must be included in any conceptual framework for research if it is to present an in-depth explanation for spatial/geographical variations in ICT impacts in terms of rural development.

In order to develop a philosophical perspective upon which a conceptual framework for research into ICTs and rural development (through the medium of rural businesses) may be based, it is useful to draw on the relevant aspects of these various perspectives in both ICT impacts research and in rural geography. By critically reviewing the concepts and methods contained within these approaches the most pertinent aspects of the theoretical debate will undoubtedly inform the construction of a specific conceptual framework upon which the treatment of the research topic may be based. This framework will represent the processes whereby ICT uptake and use in rural businesses creates wider rural development impacts on a local, regional and national scale.

The following sections examine in more detail the prominent perspectives which have underpinned research into ICT impacts, highlighting the strengths and weaknesses of the approaches of various researchers in the field. Particular attention is paid to the appropriateness of the methods used for the purposes of exploring patterns of ICT uptake and use by rural businesses and decision-making processes in relation to these technologies.

3.2.1 Positivist approaches

Positivist approaches in human geography gained widespread adoption in the 1950s and early 1960s through a desire to make the subject more scientific and so more creditable (Johnston, 1986b). This occurred slightly later in the rural geography sub-discipline. The

positivists' main aim was to look for generalizations, and the methods of data collection associated with their approach facilitated the representation of results in mathematical and statistical form, hence supporting the new lust for the generation of large volumes of data which was being fueled by the quantitative revolution (Cloke *et al*, 1991). The positivist epistemology (or theory of knowledge - its nature, type and origins, etc.) was based on evidence of experience. Positivist explanation was to be achieved via structured (theory-led) observations taken as examples of categories. Its ontology (the theory of what can be known or what exists) asserts that only that which could be directly observed (and measured) was acceptable as evidence (Johnston, 1986b). According to Healey and Ilbery (1990, p.20), positivist approaches in human geography were based upon four main assumptions:

1. there is an identifiable order to the material world
2. decision makers are rational and react in the same way to given stimuli
3. decision makers have complete knowledge and are profit maximizers
4. economic activity takes place in a freely competitive environment and on a uniform (isotropic) land surface.

Positivist reasoning in human geography was of a hypothetico-deductive form, i.e. patterns were derived from theorizations rather than practical observation in the field. Working on various theoretical assumptions, normative models were constructed with which processes and patterns occurring in the real world were expected to concur. The emphasis was on the verification of theory in replicable experiments which was held to be the only way of proving the "veracity" of hypotheses (Johnston, 1986b, p.53). These models, such as Weber's famous (1929) model of industrial location, although providing a useful framework upon which to build, were flawed in their use of unrealistic assumptions concerning human behaviour and have since been greatly reworked and modified. In the rural economy such work concentrated on agriculture (e.g. Von Thünen) and rural settlements and services (e.g. Christaller), since at that time industry was considered to be a wholly urban affair. It was not until much later that work in the rural sub-discipline became concerned with technological advancement.

Positivist approaches have since been widely criticized for a number of reasons. Firstly, much criticism has been related to the fact that the applicability of theories, and laws in particular, although appropriate in the physical sciences, is highly questionable in social sciences such as rural geography (Johnston, 1986b). Secondly, positivist approaches are deficient in empirical content, i.e. they lack adequate description and inductive explanation of existing patterns. Thirdly, the assumptions of certain attributes of behaviour such as cost minimization and profit maximization are flawed. Fourthly, the positivist models attempt to explain patterns from within, thus ignoring the influence of factors external to the patterns themselves. Such models also ignore both the historical and locational context and do not make provision for change over time. Finally, the socio-cultural context is taken for granted and thus such models are only applicable to the type of situation under which they were originally conceived (Daniels, 1985; Healey & Ilbery, 1990; Johnston, 1985; 1986a; 1986b).

Positivist approaches (in their purest sense) in ICT impacts and rural development are uncommon. However, Lipshitz (1993) used a broadly positivist approach to look at one policy strategy for regional development - that of promoting the geographical dispersal of 'high-tech localities'. Lipshitz outlined two theories which may explain the creation of core-periphery contrasts in economic development, suggested to result from the influence of population migration, capital investment flow, innovation diffusion and the spatial organization of political power. Firstly, the "convergence approach" postulates that core-periphery disparities will, over time, be minimized, or even eliminated, due to the increasingly free movement of the factors of production (labour and capital). Secondly, the "divergence approach" suggests that this increase in movement of factors of production will, in fact, eventually lead to increased inequality between core and periphery areas. The situation may only be rectified by government or planning authority intervention (Lipshitz, 1993, p.40). The empirical research employed a positivist methodology to study high-tech growth centres in the Galilee (Israel). This involved an extensive survey to investigate the effect on spatial-economic factors of the introduction of high-tech growth centres in the 1980s. The study was concerned only with objective facts pertaining to the characteristics of those interviewed, such as firms' supplier patterns and consumers' shopping patterns with respect to the new localities. There was no investigation of the mechanisms whose

operation causes such patterns and thus no explanation - only description.

The results of the research illustrate the effectiveness of positivist methods in establishing information concerning spatial patterns and deriving previously unknown factual information about patterns within populations - in this case firms and shoppers. In the context of developing economies where the constraints on technological progress are still mainly down to the availability of technology, i.e. the coverage of the telecommunications network, a positivist methodology can provide an informative overview of the situation. However, it provides no explanation of causal processes.

Capello & Nijkamp's analysis of network externalities in the telecommunications sector provides an insight into the factors affecting the costs and benefits to subscribers (both firms and individuals) of joining networks (Capello & Nijkamp, 1996). The concept of diffusion of strategic information and communications technologies is approached in terms of economic theories and represents a perspective which supports both the information economy school of thought and positivism. The economic theories identified by Capello & Nijkamp as being relevant to the study of network externalities of ICTs are "telecommunications as the motor for economic growth and network externality theory" (p.8). Network externalities are said to exist in the ICT sector due to the fact that

> "the user-value of a network is highly dependent on the number of already existing subscribers or clients. This means that the choice for a potential user to become a member of a network is dependent on the number of these participants"
>
> (p.8).

This concept has implications for the impacts of ICT use and thus for policies surrounding it. This positivist (inductive) analysis uses diffusion theory and economic theories of supply and demand to develop a model of factors governing firms' decisions to join a network, concentrating on economic and social costs and benefits. Factors included in this model "represent the most common variables mentioned in the literature on telecommunications diffusion processes as those variables having a strong influence on the decision to adopt these new technologies" (pp. 22-23). The work is thus inductive and there is a notable absence of any attempt to examine location-specific and firm-specific

variables in the field. Directional causality is built into the model, but again this is determined from previously published literature, much of which is based on theory rather than actual field research.

This type of approach to the study of ICT impacts cannot therefore account for the human factors involved in ICT uptake and use, which might shed more light on the real causes and processes behind the patterns revealed. Applied to the UK, where technology is much more widely available, such a research methodology would thus be inadequate in the study of ICTs and rural development, since the types of factors it deals with are no longer of prime importance in determining patterns of uptake. Research which began to recognize the effects of behavioural factors (such as individual choice) in ICT impacts was to emerge later (for example, Clark *et al.*, 1995 and Ilbery *et al.*,1995).

Although little research into ICT impacts is purely based on a positivist philosophy, there is an equivalent stage of development which is well represented in the ICT impacts literature. This essentially positivistic branch of the literature is the subject of the following section.

3.2.2 Technological Determinism

The technological determinism approach comprises two main strands of thought - *technology availability* and *diffusion theory*. Technological determinism is evident in work which places emphasis on theories of Kondratieff Long Waves, for instance, which suggest that economic development is led by technological change - with the current (fifth) Kondratieff being driven by information technology and leading to the emergence of a so-called "information economy" (Hepworth, 1989). This implies that there is some sort of "technological inevitability" and that economic change is driven by technological advancements rather than vice versa, thus rejecting the notion that technological change is an economic and political process (Healey & Ilbery, 1990, p.102).

Availability of technology:

Work in this vein on the impacts of ICTs includes many of the earliest writings in this field of research. For instance, Rothwell's (1982) paper on the role of technology in industrial change drew on Schumpeter's proposition of the central role of technology in the formation of Kondratieff long waves. This view maintained that, although a "confluence of favourable factors - economic, technological, political, social and demographic" was necessary to bring about such change, it was "new technological capability" which was the *central driving force* (Rothwell, 1982, p.368 - emphasis added). The technological determinism perspective upheld the notion that disparities in the availability of new technologies were the main determinants of whether or not, and to what extent, telecommunications and information technology (and later telematics) would be adopted by firms. Thus adoption would be more widespread in areas where availability was greater, such as in metropolitan and urban areas and along major communication routes such as roads (for example, the M4 corridor). Availability of technology was the overriding force which led to the resultant spatial patterns of ICT uptake. Later work recognized that the availability of telecommunications alone could not have beneficial economic effects without being integrated with changes to organizational structures and workstyles (Goddard & Pye, 1977, p.29).

Richardson & Gillespie (1996) refer to work from the 'availability of technology' perspective as following an *infrastructuralist approach*. This view, which prevailed in the late 1980s, suggested that if advanced infrastructure (such as digital networks) was universally accessible rural areas would be able to benefit from ICTs to the same extent as core areas. Much of the work instigated by the European Commission was based on such an "infrastructure-based approach" and programmes such as STAR (Special Telecommunications Action for Regional Development) were largely aimed at improving and digitizing telecommunications networks (Richardson & Gillespie, 1996, p.92). However, this approach has been superseded by the realization that provision of infrastructure alone will not lead to economic growth and development; adoption and use of technology must also be encouraged. Infrastructural deficiencies are no longer seen as the primary obstacle to ICT diffusion in rural and peripheral areas, rather it is the demand for advanced ICT services which is insufficient (Grimes, 1992).

Diffusion theory (introducing the element of behaviouralism):

However, another perspective which emerged in the positivist (behavioural) school in human geography was Torsten Hägerstrand's work, in 1953, on the spatial diffusion of innovations (Brown, 1981; Rogers, 1983; Unwin, 1992). Hägerstrand used mathematical modeling to study the spread of innovations in Sweden, which resulted in the development of his "probability model of the diffusion process" (Unwin, 1992, p.121). He suggested that the diffusion of innovations, "the origin and dissemination of cultural novelties ... [is a] ... process of unquestionable relevance" (Hägerstrand, 1967, p.1). Hägerstrand shifted the focus of diffusion research to the underlying "generative processes" (Brown, 1982, p.18) and specifically mentioned communications media and facilities as innovations that have spread to become characteristic of regions.

From his early work on diffusion patterns in urban systems using cartographic methods, Hägerstrand further developed his diffusion theory to incorporate statistical analysis and mathematical modeling. This led to the identification of the *diffusion process* as well as pattern at all spatial scales. This was further developed by Brown in 1975 to incorporate qualitative analysis through the study of case study evidence (Brown, 1981, p.35). It is of further note that Hägerstrand's later research in 1967 cited *communications* as the dominant process involved in the formation of spatial patterns of innovation diffusion. However, a later study by Brown (1969), in failing to successfully apply Hägerstrand's model at a regional scale, concluded that the speed of information transfer alone could not account for the time taken by some diffusion to reach localities in relatively close proximity, citing instead "marketing and infrastructure development" as the forces responsible for diffusion (Brown, 1981, p.34) - i.e. external influences. This work also suggested the need for much more emphasis to be placed on the *behavioural* aspects of the potential *adopter.*

Within diffusion theory itself there are two perspectives. The first is the *adoption* (or *demand*) *perspective* which is embodied in the work of Hägerstrand (1953 & 1967) and holds that diffusion is driven by individuals' demand for new technologies. The emphasis of this point of view is therefore on behavioural characteristics of the potential adopters.

The second perspective is the *market/infrastructure* (or *supply*) *perspective* detailed in the work of Brown (1981). This perspective holds that the diffusion process is driven by the agencies which supply the innovation and by their policies. According to this school of thought, market segmentation and the provision of infrastructure and communications are crucial factors. Agencies attempt to stimulate demand by targeting their marketing efforts and thereby influence the innovation-diffusion process from a position external to the process itself.

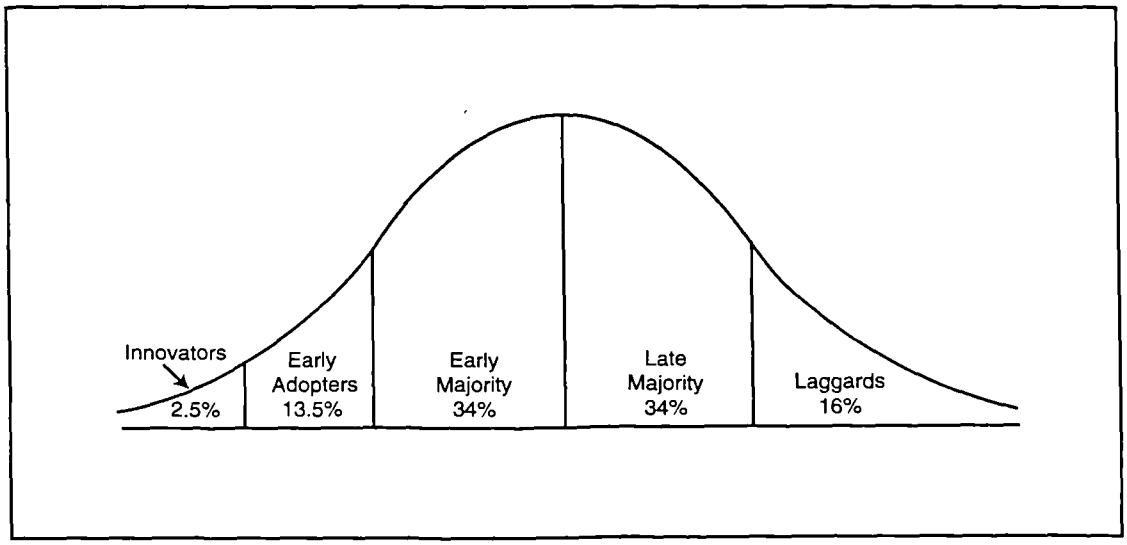
Blaut (1977) argued that diffusion should be seen as a force for cultural change. Rogers (1983) suggested it is a kind of social change whereby new ideas are spread through a social system, causing change in both the structure and function of the system; it may be either planned or spontaneous. He identified four main components of the diffusion process - the innovation, communication channels, time and the social system

1. An ***innovation*** may be an idea, an object or a practice which is perceived as new. This research is concerned with a technological innovation (i.e. ICTs - the combination of information and communications technologies). An innovation usually consists of two components - the tool which embodies the innovation as a physical entity (the hardware) and the information base (the software). Where technological innovations are concerned, in some cases "technology clusters" have been identified. These consist of a number of distinguishable, but closely related, elements and may be used by 'change agents' since they are sometimes adopted more rapidly (Rogers, 1983, p.14). It should be noted that all innovations do not have the same *relative advantage* over that which they are expected to replace, nor do they have equivalent levels of *compatibility* with existing values, experience and needs of potential adopters. They also vary in their *complexity*, and thus the ease with which they might be adopted, and their *trialability*, the extent to which they may be experimented with on a limited basis. In addition, some innovations are more conspicuous (and therefore more visible to other potential adopters) than others and this may affect their rate of uptake (Rogers, 1983, p.15 - original emphasis).

2. ***Communication channels*** are the means by which information about new innovations passes from one individual to another. Research has shown that most innovation is based on imitating the actions of previous adopters in the same peer group. Potential adopters tend, for the most part, to rely upon the evaluations of their peers rather than those of scientists and agencies. In technological innovations in particular, communication channels are more effective between individuals of similar technological skills levels; this is known as *homophily* (Rogers, 1983). For this reason it is necessary to discover the means by which potential adopters (for example, managing directors) get to know about new technologies such as telematics, and whether this means of knowledge acquisition affects whether or not they adopt the technology. It is also important to discover from which sources advice and information on ICTs are derived. Thus, these communication channels must be interrogated from the point of view of both decision makers and advisory bodies such as external agencies.

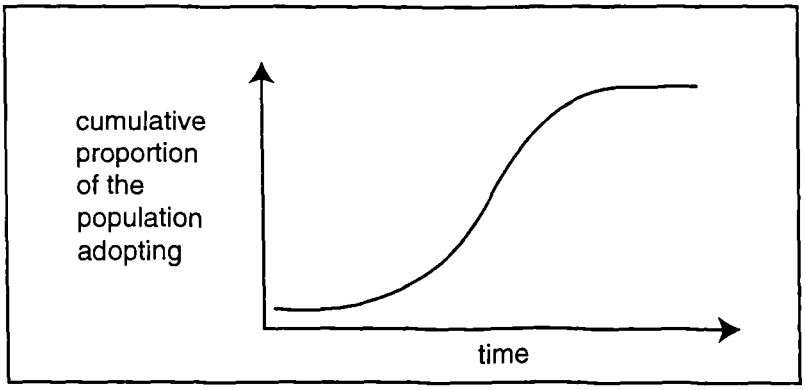
3. ***Time*** is involved in the innovation diffusion process at three levels. Firstly, it is involved as an individual progresses through the innovation decision process - through first knowledge of the existence of the innovation, to the stage of persuasion (or attitude forming), to the actual decision to adopt or reject the innovation, to the implementation of this decision, and finally to the confirmation stage where the individual may seek confirmation of the decision made. Secondly, time is involved at the level of the relative earliness or lateness of adoption by an individual in relation to the other members of the social system. These categories, based on the relative time at which the innovation is adopted, are illustrated in Figure 3.2. Finally, time is involved in the rate at which the members of a social system adopt an innovation. This may be represented by a logistic (S-curve) distribution, as shown in Figure 3.3.

Figure 3.2 Adopter categorization on the basis of innovativeness



Source: Adapted from Rogers (1983) Figure 7.2, p.247.

Figure 3.3 The S-curve of diffusion through time



Source: Adapted from Brown (1981) Figure 2.2 A, p.21.

However, referring to research carried out by Hough (1980) for the Department of Communications in Ottawa, Carey & Moss suggest that "there are several models of development and diffusion other than introduction followed by rapid growth". The growth of new technologies varies enormously with some failing instantly, others being merely short-term "fads" and still others experiencing "cyclical patterns of growth,

decline and renewed growth" (Carey & Moss, 1985, p.157).

4. Finally, according to Rogers, the nature of a ***social system*** can have a marked effect on innovation adoption, for example through the effect of system norms for tolerable behaviour - usually of a cultural or religious origin. This may cause some differentiation between the social conditions in rural areas and those elsewhere (for example, in towns and cities) and, given the diversity of different types of rural areas (Cloke, 1977; Keeble, 1990), it is also likely to lead to spatial variations in the uptake of ICTs in different rural localities. The social system may also be influential through the medium of opinion leaders (who conform closely to the prevailing system and hence present a model of behaviour to be followed by others) and *change agents* (who provide biased information, attempting to encourage or discourage adoption according to whether or not they deem an innovation to be desirable). They are *heterophilous* from the potential clients and so communication between these two groups must be facilitated by other parties (Rogers, 1983). This suggests that it is important to examine suppliers of information and advice to potential adopters to discover whether or not these *change agents* employ particular strategies in particular areas. For example, do their marketing strategies differ between urban and rural areas or, indeed, between different types of rural area (Cloke, 1977; Keeble, 1990)?

Innovation decisions may be made by individuals, firms or by an entire social system and may result in the adoption or rejection of an innovation. The rate of diffusion of innovations is usually greatest when decisions are made by authorities with power, technical expertise or social status. Other innovation decisions about particular products may be difficult before society as a whole has undertaken an adoption policy since they are dependent on the wider implementation of processes or structures (for example, the adoption of seatbelts (Rogers, 1983)). In terms of ICTs, adoption by individuals is difficult before a threshold level of adoption in society as a whole has been reached. This is known as *critical mass* and represents the point at which there are enough users of a communications medium to make it worthwhile for others to adopt the innovation and so join the network of existing users (Capello & Nijkamp, 1996).

The consequences of innovation diffusion may be desirable or undesirable, direct or indirect and anticipated or unanticipated (Rogers, 1983). This property of innovations will be especially applicable in looking at the impacts of ICT adoption and use on rural development, both in an economic sense and from a social and welfare position.

There is, in fact, very little empirically-based research from the technological determinism perspective - most literature being of a speculative nature, reviewing previous work in the field. However, an early empirical research paper on advanced telecommunications systems and office location, although not explicitly stated, derived conceptual ideas from a technologically determinist perspective (Goddard & Pye, 1977). The authors concluded, however, that factors other than the *availability of technology* were important in creating regional economic impacts (in this case - office relocation through a substitution of travel by telecommunications). Factors included other policy changes such as, at the macro scale, linked financial incentives to firms and, at the micro scale, changes to organizational structures and working practices within firms. These conclusions question the validity of a technologically deterministic approach to ICT impacts research.

Uncertainty as to the actual impacts of ICT uptake and use is something ignored by many writers to date. There has so far been an underlying assumption that the consequences will be beneficial in terms of rural and/or regional development. A number of writers, such as Gillespie (1987) and Grimes (1992), have recently begun to question this view. Similarly, Ilbery *et al.* (1995) suggest that, far from having beneficial effects on the economic and social development of peripheral areas and regions, ICT adoption perpetuates the accruing of benefits in the core urban and industrial areas at the expense of the periphery.

Thus, in overlooking the fact that human behaviour is "largely goal-directed", the behaviouralist perspective (in its positivistic manifestation at least) views the effects of innovation diffusion as being almost deterministic (Walmsley & Lewis, 1984, p.53). In the field of research into ICT impacts, this gave rise to what has become known as the 'information economy' perspective. This is the subject of the following section.

3.2.3 Information economy approaches

In a considerable proportion of the existing research into the impacts of ICTs, their growing importance has been considered to be part of the development of an 'information economy' or 'information society'. Information economy approaches, also termed post-Fordist (Grimes, 1992; Gibbs & Tanner, 1997), were pioneered by social scientists such as Machlup (1962) and Bell (1973). They emphasize the gradual and comparative increase in the proportion of jobs in information-related sectors leading to the emergence of an 'Information Economy' or 'Information Society' (Freeman, 1994). It has been suggested, however, that there are so many conceptual variations of what constitutes the 'information economy' that many who use the term "are probably in greater agreement with those rejecting it than with many other users!" (Miles & Matthews, 1992, p.92).

The central thesis of information economists is that "information is a key strategic resource which is central to the effective delivery of goods and services in all economic sectors" and that in the information economy, the production, processing and distribution of information and the supporting infrastructure "account for the greater proportion of employment" (Gibbs & Tanner, 1997, p.30). Gillespie & Williams (1988), in conceptualizing the role of advanced telecommunications in economic development, suggest that "the information economy is characterized by a new paradigm bounded on the one hand by the diffusion of information *technology* and on the other by the commodification of *information*" (p.1312 original emphasis). This commodification of information is facilitated by the convergence of information and communications technologies, which "allows a greater degree of integration of local and national economies into the global economy, allowing a more sensitive exploitation of differences between areas" (Gibbs & Tanner, 1997, p.30).

Graham & Marvin (1996) suggest that, not one, but at least six analytical perspectives have developed in the literature to outline this "transformation from an industrial, manufacturing dominated society to one dominated by information, communications, symbols and services" (p.6). They identify these approaches as:

1. the information economy approach
2. the post-industrial society thesis
3. the information society thesis
4. the technoeconomic paradigm
5. the post-Fordist approach, and
6. the post-modern approach (p.45).

The information economy approach has been criticized by Gibbs & Tanner for its emphasis on description at the expense of explanation. They suggest that information economists, in failing to explain the *processes* of economic change, cannot give any indication of the possible success of the policies they recommend in solution to uneven development (Gibbs & Tanner, 1997, p30 - emphasis added).

Garnham's critique of the information society thesis focuses primarily on its wide acceptance by policy makers in the 1980s. He argues that such a critique is particularly important given, on the one hand, the extent to which many of the assumptions of the thesis can now be disproved and, on the other hand, the fact that "despite the accumulating evidence against them, they still retain much of their old hold, at least in the policy arena" (Garnham, 1994, p.42). He reproduces the summary of these assumptions put forward by Dutton *et al.* (1987):

1. consumers want and seek more information
2. communication is of central and increasing economic importance
3. the new electronic media are inherently democratic and de-centralizing
4. the telecommunication infrastructure is a public utility rather than a private commodity
5. long-term rational planning of communication is both possible and desirable (p.43).

He suggests that, not only were the assumptions of the Information Society theorists descriptive, they were also "highly prescriptive", suggesting how ICTs *should* develop. The notion was put forward that information technology and communications could "lead

the United Kingdom out of recession and ensure ... international competitiveness" (p.44). Garnham emphasizes the failure of convergence between home and business uses of ICTs to materialize and the fact that large corporate users, rather than SMEs and domestic users, remain the main beneficiaries of the new technologies, as clear indications of the deficiencies of the Information Society thesis. Garnham recognizes the importance of technology in the search for "social solidarity", but suggests that "it is unlikely to bulk very large as either problem or solution" (p.48). For this he has been criticized by Gibbs & Tanner (1997) who argue that the very fact that ICT use by major corporations has increased the centralization of power relations and that social and economic marginalization persists makes it all the more important to recognize and understand the role of ICT development (p.31). They support a regulation theory approach (detailed in section 3.2.7) in endeavours towards such an understanding.

Freeman (1994), in examining the diffusion of ICTs in the world economy in the 1990s, adopted an approach which he termed the ICT paradigm. This composite approach accommodates features of the previous *Information Society approach* (with its emphasis on the growth of information-related occupations), the *IT sector approach* (with its bias towards job creation) and the *Automation approach* (implicitly biased towards job displacement) in an attempt to "overcome their one-sidedness" (p.13). The ICT paradigm "defines ICT both as a new range of products and services **and** as a technology, which is capable of revolutionizing the processes of production and delivery of all **other** industries and services" (Freeman, 1994, p.13 - original emphasis). However, Freeman, while recognizing the pervasiveness of changes in technologies and justifying the use of the term 'technological revolution', stresses that the ICT paradigm is "not simplistic technological determinism" (p.35). The process of diffusion of innovations is recognized as being driven by human agency; with ICTs, as with many other technological innovations, this is inherently related to projected financial gains. The spatially uneven nature of this process of diffusion is a result of its dependence on "institutional capacity" (i.e. the ability of institutions to make the necessary changes to existing organizational and production systems to enable ICTs to be wholly and effectively integrated into the economic, social and political system) and is thus likely to result in disparities of development at all geographical levels (p.36). The fact that investment in information technology has failed

to cause the expected widespread productivity gains anywhere in the world is seen as evidence that the pure Information Society/Information Economy thesis is fundamentally flawed.

Garnham suggests that future research into the implications of ICTs must focus on information "in its widest sense, on the ways in which human agents share experiences" (Garnham, 1994, p.48). He advocates a two-pronged approach - a sociology of information production accompanied by a sociology of information consumption. An historical sociology of information production is necessary, based upon the assumption that "informational power is differentially and hierarchically distributed and involves social specialization". Such research must take into account the "social origins and position, ... characteristic dispositions, practices and ideologies" of information workers and must study those responsible for the perpetuation of the Information Society thesis. The sociology of information consumption would entail research into the "social appropriation" of information, "the process by which individuals and groups make use of the information resources at their disposal to make sense of and act upon the world" within the context of existing social, economic and political structures (p.49).

The next section introduces theoretical perspectives which begin to address this recognized need to take into account the human agency dimension of the ICT uptake and impacts - those of behavioural science and humanism.

3.2.4 Behavioural approaches

The earliest behavioural approaches of the 1960s originated in the dissatisfaction felt with normative and mechanistic models "based on such unreal behavioural postulates as rational economic man". The behavioural movement sought to investigate at the level of the individual, focusing on the "information-processing and acted-out behaviour" of individual decision makers (Walmsley & Lewis, 1984, p.1). This it did via inductive methods. However, since the ultimate goal of behavioural research was still to discover generalizations it retained an essentially positivist approach to methodology.

There are a number of salient points, however, which identify the behavioural perspective.

Firstly, behaviouralism, although still concerned with spatial patterns, takes into account a much wider range of variables, including attitudes, perceptions, values, opinions and motives. What distinguishes the behavioural perspective is that emphasis is placed on the processes which create the patterns, rather than on the actual spatial outcomes themselves (Healey & Ilbery, 1990). Hence, the decision-making process is of major importance in behavioural models.

With particular relevance to this research, behavioural approaches have been widely used in the study of information flows, especially in relation to innovation and diffusion (Golledge *et al.*, 1972. Cited in Walmsley & Lewis, 1984, p.4). These are discussed in detail in section 3.2.3. Behavioural approaches were the first to put forward the idea of a "mutually interacting relationship" between society and the environment, whereby "man shaped the environment and was subsequently shaped by it" (Gold, 1980, p.4).

As with all theoretical perspectives, however, critics have highlighted a number of flaws in the behavioural viewpoint (Walmsley & Lewis, 1984, p.1). Firstly, behavioural writing has often applied borrowed terminology rather loosely and inappropriately. Secondly, behavioural scientists have been criticized for being overly concerned with what goes on in the mind rather than with acted-out (observable) behaviour. For example, the links between attitudes and behaviour, and perceptions and spatial behaviour are not clear - there is no investigation of 'process'. Finally, behavioural geography has been seen as "dehumanizing" since behaviour itself is viewed as nothing more than a stimulus-response relationship whereby particular responses may be expected under given conditions (Cloke *et al.*, 1991, p.68). This feature is seen by many human geographers as limiting the scope of this approach.

Other criticisms of the behavioural perspective abound (Healey & Ilbery, 1990). It is suggested that, rather than solving the problems of the neo-classical approaches, behaviouralism simply *replaces explanation with description*. So, for example, in the case of decision-making within rural firms, the emphasis has been on *how* decisions are made as opposed to *why*. The behaviouralist perspective assumes a congruence between cognition and behaviour which is not necessarily valid; the mind is treated as little more than a

'black box' with little or no understanding of what goes on within it. The approach has also been criticized for placing too much emphasis on choice and not paying enough attention to the existence of constraints and external structures. Finally, behavioural geography has been criticized for its lack of methodological development. Burton (1963) postulated that the reason why the behavioural approach has not attained more prominence is that its conceptual thinking has developed faster than have methods of testing such thinking (Cited in Walmsley & Lewis, 1984, p.9.).

Some of these criticisms can readily be applied to behavioural research in the field of ICTs and rural development. With specific reference to ICT impacts, a behaviouralist perspective emphasizes the need to incorporate the personal attributes of entrepreneurs (such as perceptions, goals, values and motives) in explaining the patterns of uptake of ICTs in rural businesses. As previously mentioned, this emphasis has become increasingly important as the availability of ICTs has become widespread.

A number of research papers in ICT impacts have implicitly adopted a perspective which equates to a type of positivist behaviouralism. Among these, the most notable are those reporting on research carried out under the auspices of the Commission for the European Communities (CEC)/European Union (EU). Particularly relevant to this thesis is a body of research undertaken as part of the EU's SARBA (Services and Applications for Rural Business Activities) project. Research by CLED (the Centre for Local Economic Development) in 1993, Ilbery *et al.* (1995), Clark *et al.* (1995) and Berkeley *et al.* (1996) specifically examined telematics uptake and use in rural businesses in Warwickshire and Lancashire. CLED's (1993) consultative report on this survey presents the results of an extensive survey of 928 businesses in south Warwickshire and north Lancashire. The survey was designed to examine levels and types of use of telematics equipment and applications among different types of rural businesses. The positivist and extensive nature of this research meant that the mainly quantitative findings were aggregated from the level of the individual firm, thus losing important detail. While important information was gleaned regarding the patterns of uptake and use of telematics by the businesses in question, this was purely descriptive and the methods used could not ascertain the reasons why such patterns of telematics adoption were found. However, the work highlighted the

need to delve much deeper into the human agency aspect of this field of study in order to explain why firms take up technologies to varying extents and to explore the possible implications of these patterns of uptake from a policy point of view.

Clark *et al.* (1995) more explicitly elaborated on the research methodology employed and, in particular, the behavioural element which it considered. However, this approach, although recognizing the influence of human characteristics in telematics uptake, did not really address the actual cognitive processes which link perception with behavioural response, a failing often recognized in behavioural research (Cloke *et al.*, 1991). While the empirical work did include face-to-face interviews with rural business managers, these interviews were highly structured and sought information on problems experienced by the businesses and "the potential relevance of telematics" (Clark *et al.*, 1995, p.177). These interviews did not examine fully all the aspects of the internal environment which might be influential in the uptake of new technologies, for example, the decision-making processes going on within the firm. The results were thus more descriptive than explanatory, highlighting business problems as perceived by managers and detailing possible telematics-based solutions to some of these problems. Barriers to telematics uptake were examined, but the actual ways in which these affect the decisions made within rural businesses were not addressed.

The study concluded that "on the whole there is still a wide gap between what is possible with telematics, and the extent to which those potentials are being realized by rural businesses and are benefiting rural economies" (p.178). It was suggested that present low levels of uptake could be enhanced by increasing awareness, availability and accessibility. A need to target businesses was recognized and it was proposed that this could be most effectively achieved by agencies. This suggestion implies that a gap exists in this and other empirical work, where there is a need to survey the relevant agencies which might be involved in any such promotion of ICTs and thus in influencing their uptake. Without this structuralist angle on the impacts of telematics, an holistic view of the opportunities and constraints faced by rural business managers cannot be fully realized.

Berkeley *et al.* (1996) make reference to these wider structures, suggesting that it is the

role of policy makers in rural areas to raise awareness of the potentials of telematics for business solutions and to "engender a technology culture amongst rural SMEs" (p.83). However, the empirical work upon which these proposals are based does not include any direct examination of the attitudes of agencies in rural areas towards new technologies and does not account for their current levels of knowledge regarding advanced ICTs. Only by approaching the agencies themselves can this type of information be obtained and informed suggestions be made as to future policy requirements.

Thus it is clear that, while a research methodology informed from a positivist behavioural perspective is useful in ascertaining patterns of ICT adoption and use within a population, the results are of a generalized and descriptive nature and lacking in explanation. Such research also fails to recognize fully both the wider economic, political and social context within which the uptake of ICTs by rural businesses operates (i.e. the external environment) and the complex processes at work within the business (i.e. the internal environment).

3.2.5 Humanistic approaches

A later body of behavioural work tried to correct the failings of behavioural positivism. Humanism effectively "divorced ... [itself] ... from positivist methodologies" (Healey & Ilbery, 1990, p.25). The term 'humanistic geography' was first used by Yi-Fu Tuan (1976) to signify a perspective which reveals the "complexity and ambiguity of relations between people and place", something which the positivist perspective had failed to do (Daniels, 1985, p.143). The term humanism covers a wide variety of approaches which attempt to break away from preoccupations with quantitative methods. Humanism rejects the positivist notion of an objective world, looking instead at how individuals experience the world about them. The focus is therefore on *experiential environments*, highlighting the meanings ascribed by human beings to their surroundings. The individual is hence considered as a thinking being rather than as a "bundle of fragmented responses to diverse stimuli" (Walmsley & Lewis, 1984, p.153). Humanistic epistemology stresses the subjectivity of knowledge, highlighting intentionality among individuals. Its ontology holds that "knowledge can only be obtained from what exists in the human mind" (Johnston, 1986b, p.96). There are three main positions within humanism -

phenomenology, existentialism and idealism (Walmsley & Lewis, 1984). All advocate the following levels of investigation:

1. the everyday world (usually taken for granted)
2. new elements brought into this behavioural environment
3. theories which link these elements and provide a "code of conduct"
4. "components of pure consciousness" forming and regulating the theories and perceptions involved in the creation of behavioural environments (Johnston, 1986b, p.96).

Humanistic research uses examination at all these levels to gain an understanding of individuals and their relationships both with others and with their environment. Humanistic methodologies employ *qualitative* research techniques such as ethnography and participant observation in order to gain an understanding of the thought processes behind individuals' decision-making actions. This would appear to provide a useful means of gaining an understanding of the factors which influence the adoption or non-adoption decisions made by decision-makers within rural firms.

Given that advanced technology infrastructure is now widely accessible in the UK, it would seem that the very factors upon which humanism focuses are those now likely to be most influential in the decision-making process with regard to the adoption of new ICT equipment and applications. Surprisingly, from this point of view, the literature reviewed has shown a marked absence of humanism-inspired methodologies. Up until now, research into ICT impacts has apparently overlooked the need to understand the cognitive process which plays an ever-increasing part in producing the patterns of uptake and use of ICTs. This may be related to the corresponding lack of empirical work which has been carried out within a humanist framework in geography as a whole (Cloke *et al.*, 1991).

Several authors in the field of ICT impacts literature have highlighted the importance of human agency in the adoption and resultant impacts and implications of ICT use (Graham & Marvin, 1996; Mansell, 1994). In reviewing the work of PICT (the Economic and Social Research Council's Programme on Information and Communication Technologies),

Mansell notes the emphasis of much of this work "on the social **processes** which underlie and shape technical and institutional innovations" and the importance of this "focus on people, the creative potential of human agency and decision making" (p.4). He cites the fact that ICTs are "developed through social relations between actors and [that] these relations are structured by space and time considerations" (p.274). This implies that the interaction of these processes must be examined in order to understand the true nature of the social and economic impacts of ICT adoption and use and the implications of these for rural development. Thus a humanistic approach is required, but set within the wider context of structural influences and mechanisms.

Likewise, Graham & Marvin review the social construction of technology (SCOT) approach which rejects technologically and socially deterministic perspectives on ICT impacts. This approach proposes, instead, that the development and use of technologies is shaped by human agency and social and political processes; that choice exists in the way in which technologies are designed, developed and adopted (Graham & Marvin, 1996, pp.104-105). Research from this perspective thus seeks, at the micro level, to

> "identify, analyse and explain *causal* relationships between social, institutional and political factors and the development and applications of technologies ... to understand how technology and its uses are socially and politically 'constructed' through complex processes of institutional and personal interaction, whereby many different actors and agencies interplay over periods of time" (p.105).

Thus it is implied that ICT adoption and use will result in very different impacts under various local combinations of factors. Further, it is clear that humanistic enquiry would be appropriate to this field of study if applied within the context of broader structures, thus recognizing the influence of external agency. These themes are developed in more detail in section 3.3.

Some recent work, however, has employed *elements* of humanistic enquiry to examine the uptake of ICTs in more depth. For instance, Richardson & Gillespie (1996) used in-depth interviews with public and private sector partners in an ICT-based regional economic development initiative in the Scottish Highlands and Islands, as well as firms operating

within the initiative's target area, to examine its current and future potential impacts. Nijkamp & Pepping (1996) also used in-depth interviews in their research into the use of ICTs as strategic tools in the Dutch transport sector. They interviewed public sector road transport managers about their attitudes and expectations of applying ICTs to their networks. Private sector freight operators were interviewed to glean information on current and potential future levels of penetration of ICTs in the sector and attitudes of operators towards these new technologies and their implications. However, it is clear that, while these methodologies contain some elements characteristic of humanistic enquiry, they do not, in themselves, embrace the humanist position to its full extent. They attempt to investigate how individuals experience the world, i.e. by questioning interviewees on their attitudes and opinions, thus extending somewhat beyond the conventional quest of previous researchers for purely factual information. However, they fail to examine fully the relationships between individuals and their environment or to explore in-depth the thought processes behind decision-making. The research methodologies, although essentially qualitative, do not explicitly recognize the subjectivity of knowledge nor the importance of the intentionality of individuals, both of which, from a humanistic perspective, are considered essential to understanding decision-making processes.

Thus, although some of the methodological elements of humanism have been used in ICT impacts research, much behavioural work remains essentially positivist in nature. As such, it highlights the enormous scope in this field of research to employ methodologies more firmly grounded in a humanistic framework. Such an expansion of humanistically-driven qualitative enquiry would impart a more in-depth understanding of how the perceptions and motivations of decision-makers in rural businesses interact with other influencing factors in the environment, both internal and external to the firm itself, in the formative stages of decision-making. Thus some of the most important influencing factors in the process of ICT uptake and use could be identified and a clearer understanding gained of the potential impacts of this use on rural development. The value of encompassing a recognition of structural context is borne out in the more holistic view obtained of the internal and external decision-making environments within which firms operate (see section 3.3).

For a critique of humanism, it is necessary to look at the rural geography literature, since no such evaluation exists in the ICT impacts literature. The difficulty in assessing humanist approaches lies in the fact that they aim to improve understanding rather than explanation and prediction (Johnston, 1986b). There are a number of inherent problems in doing humanistic research, the main one being that it is very difficult to communicate aims and results due to the constraining limits of the power of language. Olsson voiced this concern, saying that "what is judged to be true and just is not independent of the language in which that judgment is phrased" (Olsson, 1975, p.26. Cited in Johnston, 1986b, p.95).

Criticism from positivist geographers suggests that humanistic approaches are subjective and therefore unscientific, rendering them of little use in actually changing things in the real world. Structuralists, on the other hand, have criticized the level of attention given to the individual, claiming that individuals are accredited with having much more choice and freedom in their actions than they do in reality. Structuralist critics suggest that the external environment is much more constraining and individuals are much more bound by it than humanistic approaches would lead one to believe (Johnston, 1986b).

Other critics suggest that humanistic approaches have failed to develop theory (Healey & Ilbery, 1990). However, in opposition to this view, others have claimed that there is plenty of theoretical development and rather that it is the practical application of this theory which has been scarce. In the words of Daniels, "there is less reticence about how humanistic geography should be conceived than about how it should be done" (Daniels, 1985, p.147). For these reasons (and, in particular, the fact that behaviouralists, as a whole, have disregarded the existence of external constraints and the effects of social, economic and political structures) the structuralist response emerged in an attempt to provide a more all-encompassing perspective on pattern and process in human geography research. The application of structuralist and political economy approaches to the study of ICT impacts are the subject of the following section.

3.2.6 Structuralism and the political economy of ICT impacts

Emerging in the field of ICT impacts research in the 1980s and early 1990s, structuralist and political economy approaches (which had already been prominent in rural geography

research for almost a decade) became popular as writers and researchers began to realize the importance of external factors, such as economic, political and social structures, in the formation of patterns of ICT uptake and of regional and rural development which may be associated with the adoption of these new technologies. This section provides a brief overview of the principles of structuralist and political economic theory and highlights the strengths and weaknesses of the approach, with particular reference to the literature on ICT impacts which has adopted this perspective.

Structuralism takes behavioural approaches one step further, arguing that the behaviour of individuals is ultimately constrained by wider social, economic and political processes (Healey & Ilbery, 1990). Structuralists argue that "the explanations of observed phenomena must be sought in general structures which underpin all phenomena but are not identifiable within them" (Johnston, 1986b, p.97). In other words, explanation cannot come solely from within the patterns themselves because there are external factors at work. It is necessary to go beyond the surface structures of observed phenomena to the deeper structures in order to explain patterns and variety (Rossi, 1981. In Johnston, 1986b). All behaviour is thus a result of the underlying and unseen mechanisms which are held within structures and are empirically unobservable (Johnston, 1986a). It is the goal of structuralist analysis to identify such mechanisms through theory.

From this perspective, therefore, the impact of patterns of ICT uptake on rural development cannot be adequately explained without continual reference to the underlying structures of the society within which they occur. These structures are embodied in the political and economic situation and, on a wider scale, the prevailing capitalist mode of production. Hence, there must be adequate reference to the *macro-scale processes* involved. Structuralist theory has been particularly important in its application to the geography of development. It has provided an alternative view to the deterministic explanations of writers such as Rostow. Such structuralist analyses use Marxist theories of capitalist crises to explain how inter- and intra-national spatial patterns and structures have developed (Johnston, 1986b).

Structuralist explanations are founded on the circulation of capital and how it becomes

differentially spread over space (i.e. uneven development). This disparity is the precursor to the process of capital accumulation and hence to the restructuring of capital. There are two main positions within the structuralist school:

1. ***Structure as construct:*** ***Transformational structuralism*** interprets "structure as construct" (Johnston, 1986b). It is this transformation of underlying 'deep' structures which explains the existence and form of observed surface phenomena (Unwin, 1992). Protagonists of this position include Piaget and Lévi Strauss (Johnston, 1986a; 1986b; Unwin, 1992). Piaget explained the meaning of transformational structuralism by the fact that human beings are able to transform and structure themselves by transforming the world and constructing structures. Because these structures are *constructed by humans* they are not predestined (Piaget, 1971, pp.118-19. Cited in Johnston, 1986a, p.104 (emphasis added).) Thus, as human beings learn more about these structures they acquire the ability to change them.

2. ***Structure as process:*** The second position, derived from Marxist ***political economy***, was put forward by Althusser in the 1960s. This position holds that the explanation of observable phenomena lies not in deep structures, but in underlying social structures which are constantly changing of their own accord. This type of structuralism has also been termed "structure as process" (Johnston, 1986b, p.101). The political economy approach (a Marxist point of view) holds that the actions of individuals are governed ultimately by the economic system in which they exist, be it capitalism, socialism or anything else. Cloke (1989), writing on rural geography and political economy, observed that, just as the previous positivist views had over-emphasized the importance of spatial differentiation, political economists, in stressing the opposite viewpoint, have over-emphasized the perception of space as nothing more than a socially constructed phenomenon. Cloke suggests that the very nature of political economy studies and their preoccupation with the mechanisms and impacts of economic restructuring might be questioned.

Political economy approaches have been widely applied to agriculture, but less so to other elements of the rural economy. Cloke suggests that it was the "impoverishment" (or

inadequacy) of the neo-classical explanations for the increasing diversification of rural economies which proved the need for political-economic frameworks. Such approaches facilitated the examination of the underlying processes of capital accumulation responsible for this manufacturing shift and for changing employment patterns (Cloke, 1989, pp. 180-181).

Although the political economy perspective has benefits in recognizing the action of wider processes on the creation of spatial patterns, critics have highlighted a number of weaknesses. The most frequently cited of these is an over-emphasis on the *constraining* effects of macro processes and structures and a corresponding failure to recognize the ability of such structures to provide *opportunities*. The ability of individuals to make choices has been ignored. The structuralist perspective has had the effect of both under-estimating the options open to individuals and dehumanizing individuals themselves, rendering them no more than passive entities, completely at the mercy of the external environment in which they exist. Duncan (1985) described structural Marxism as

> "portraying actors as prisoners of fate caught in slowly grinding structures not of their own making, waiting for the evolution of social structures through contradictions to move them on to a higher stage in the evolutionary process"
>
> (Duncan, 1985, p.176-77).

In taking the view that social phenomena can only be understood as part of society's superstructure (for example, in relation to the prevailing mode of production), Walmsley & Lewis (1984) have also criticized structuralist approaches for ignoring the values, ideas and action of individuals. They go as far as saying that structuralists have failed generally "to relate the macro-scale and the micro-scale in any truly meaningful way" (p.18).

It has also been suggested that there is, in fact, a strong association with the determinism of spatial science (discussed earlier) wherein, for example, individuals who belong to a particular social class are expected to behave in the same way - a kind of internalized consciousness or ideology (Healey & Ilbery, 1990, p.29). Healey & Ilbery also criticize the structuralist approach for focusing too heavily on larger structures as determinants of individual behaviour and for ignoring the variations in economic behaviour at the level of

the individual firm. A final point raised by these authors in their critique of structuralism is the often aspatial nature of structuralist theorization which fails to take account of the details of patterns within the superstructure. This has led to doubts about the geographical effectiveness of this perspective. The benefits and drawbacks of a structuralist framework for research into ICT impacts are best highlighted in a critical review of its use in recent research in this field.

Much of the recent research into ICT impacts has adopted a broadly structuralist (political economy) perspective (Gillespie *et al.*, 1991 & 1994; Grimes, 1992; Suarez-Villa *et al.*, 1992; Graham, 1992 & 1994). This body of work considers the phenomenon of ICT impacts on regional and/or rural development within the wider context of structural change (both economic and rural) and capitalist constraints. The perspective has been termed 'dystopian', particularly in reference to its use in research into the impacts of ICTs in urban areas (Graham & Marvin, 1996).

Gillespie *et al.* (1991) take account of structural factors in their report on the findings of an extensive survey carried out in rural Scotland to discover areas of existing economic potential. The results are analyzed within the context of structural economic changes in advanced economies which are transforming the ways in which the rural areas are integrated into national economies. Both positive and negative implications for rural areas are incurred as they become increasingly subject to external forces (Gillespie *et al.*, 1991). The research supports Cloke's argument that the distinction between urban and rural areas is becoming increasingly meaningless in contemporary Western economies (Cloke, 1989). In addition, the work reinforces the emphasis on external structures as constraints which lead to geographical differentiation, between rural areas, of the potential benefits of telematics. The research seeks explanation, not in the patterns themselves, but in the structures - that is, the role of the state, capitalism and the economy.

These authors' later work reports directly the empirical analysis and the resultant categorization of the rural areas. Despite the essentially positivist behavioural research techniques used, the findings were analyzed within the structuralist framework of wider political, social and economic constraints. The main 'key factors' underlying the data were

identified using factor analysis. The three which accounted for most of the variance in the data were found to be 'rural entrepreneurship', 'information professionals' and 'metropolitan connectivity'. A high level of economic diversification in rural Scotland was revealed, implying that the role of telematics networks in different areas would be similarly diverse (Gillespie *et al.*, 1994). A further stage of the analysis used case studies (but, notably, only of the larger businesses) to dispel the myth of rural stereotypes, showing that rural businesses are, in fact, very 'hi-tech' in many cases, with respect to their telematics use and most are only being held back from higher levels of technological integration by the infrastructural constraints of the older telecommunications exchanges available to them. It is pointed out that there is widespread concern over the liberalization of telecommunications and the resultant possibility that rural areas will be faced with telematics supply-related constraints while more populated urban and fringe areas will benefit. Thus (since it was concluded that "telematics has become ... part of the lifeblood of the rural economy"), rural areas will be further detrimentally affected by such anticipated external structural constraints (Gillespie *et al.*, 1994, p.13).

Clearly this research, although employing techniques derived from positivist behavioural methodology, fully acknowledges the structural political economy framework within which spatial patterns of telematics uptake and use (and hence also of associated rural development) are produced. However, while recognizing the importance of the external environment within which businesses operate, it fails to fully investigate the complexity of factors *within* businesses which might be influential in the take-up of telematics. It is also of note that the research is biased in only examining in-depth the use of telematics in the larger businesses. As with previous, purely positivistic behavioural research, criticism has also been directed at the lack of *explanation* of the processes of change provided by this research (Gibbs & Tanner, 1997).

The political economy perspective disputes the idea that ICTs are somehow neutral and the oft-quoted ability of these technologies to benefit all sectors of the economy and society. This dystopian view is highlighted by Graham & Marvin (1996) who put forward the more radical opinions of previous authors on this subject.

> "(Information Technology) IT ... is loaded with values and intensely biased, coming 'not as a neutral force for change but as the carrier of (minimally) entrepreneurialism, nationalism, versions of masculinity, notions of citizenship and images of meritocracy (with the concomitant denial of class, gender and racial divisions)' (McNeil, 1991; quoted in Robins & Cornford, 1990)"
>
> (Graham & Marvin, 1996, p.96).

Grimes (1992) examined the ways in which ICTs may be exploited for rural development purposes within an explicitly defined, structuralist conceptual framework: "information technology within the context of recent changes in economic development and within the context of rural development". He suggested that, in order to fully appreciate the role ICTs may play in a strategy for rural development, it is first essential to place their relevance within a global perspective which takes into account national and international barriers and constraints set by policy makers and large multi-national organizations. In particular, in the context of the post-Fordist shift away from mass production, information can be identified as the key resource enabling the shift from economies of scale to economies of scope, with more emphasis on design, creativity and innovation (Grimes, 1992, p.270). This is reminiscent of technologically deterministic perspectives and Information Economy approaches. In Grimes' paper, the emphasis is again weighted towards the constraints which are imposed by the global economy, rather than towards the opportunities which might be presented. In addition, Suarez-Villa *et al.* also emphasized the constraining abilities of macro-scale structures in their study of international borders as barriers to communication and information technology diffusion (Suarez-Villa *et al.*, 1992). These instances of over-emphasis on constraints tie in with previously cited criticisms of structural approaches (Cloke, 1989; Healey & Ilbery, 1990).

A political economy approach to ICT impacts is illustrated by the work of Graham (1992 & 1994) relating to the impacts of telematics in urban areas. In his research on networking cities, Graham contextualizes the discussion by analyzing the relationships between telematics, telecommunications and the economic and social restructuring of cities (Graham, 1994). Examining the issue of ICT impacts on cities from a political economy perspective, he proposes that telematics systems:

> "tend to be designed and applied to reflect prevailing power relations and social and geographical inequalities. The social, economic and spatial effects of telematics within and between cities derive from this 'embeddedness' of telematics within capitalism"
>
> (Graham, 1994, p.417).

By this it is implied that the development of cities as centres of power (through communication and control) is inextricably linked to the historical growth and development of telematics, thus suggesting an overwhelming element of inevitability. Graham proposes that urban telematics policies must be viewed against a background of telecommunications networks as carriers of power and "a crucial factor in the establishment, maintenance and change of [power] relations" (Samarajiva & Shields, 1990, p.93. Cited in Graham, 1994, p.419). This political economy perspective suggests that "global telematics networks are an agent tying the 'local' increasingly into the 'global'" (p.419), implying that local economies are, in effect, being subsumed by the globalization process which has been facilitated by the information revolution. It also means that local-level telematics policies can be of little use in the overwhelming constraining environment within which they must participate. Perpetuating the inevitability of the political economy perspective on the adoption of telematics applications, Graham postulates that the effect will be to polarize and fragment societies (due to telematics being increasingly privatized and profit oriented). Disadvantaged or peripheral groups will become increasingly marginalized from the sources of power, employment and information. Graham paints "a stark picture of 'information poverty'" (p.422) and of helpless individuals at the mercy of the overwhelming force of these new technologies.

A major criticism of the political economy perspective, as demonstrated in these studies, is that the human aspect of ICT uptake is overlooked or, at best, greatly underestimated. In particular, the behavioural characteristics of humans which determine the extent to which telematics can generate a situation whereby "there is no intermediate social space of public and collective life" (Robins & Hepworth, 1988, p.168. Cited in Graham, 1994, p.423.), have been ignored. For example, the gregarious nature of the majority of individuals and the overwhelming need for frequent social contact are factors which will actively mitigate against this predicted trend of increasing social isolation of the individual.

Certainly it is extremely important to recognize the powerful nature of the information economy, but it is equally important to balance this view through the recognition of human behaviour and the *power of individual choice.* This aspect is developed in the discussion of structuration theory (section 3.2.7). In addition, Graham's admission of the lack of existing understanding and knowledge, with respect to efforts to develop local small firms networks based on telematics use, suggests a need for more process-oriented research, as opposed to the outcome-oriented approaches currently dominating the literature.

Dabinett & Graham (1994) applied a political economy approach to an empirical 'locality study' examining ten case studies in Sheffield manufacturing and service sector firms. The research was designed to gain an understanding of the role of telematics networks in the restructuring process and to investigate the possible implications of new technologies for economic development within the city of Sheffield. The analysis was conducted within the context of current debates over changing global-local relations and the "broader forces of economic globalization" (Dabinett & Graham, 1994, p.607). The research examined the penetration of telematics services and applications within the ten firms and found levels of penetration to be highly variable and externally driven. The majority of firms were being forced to invest in telematics in response to "recurring crises in competitiveness" (p.612). Most had no clear telematics strategy, reflecting the perpetuation of wider structural forces at work in the external environment.

The methodology used in the research (i.e. a locality based study conducted within the context of a political economy perspective) allowed analysis of local-global power relations. The authors concluded that globalization, rather than localization, is the dominant force in the process of urban economic restructuring. Telematics are perpetuating the dominance of large and multi-national organizations and tying local firms to global markets and economic systems. "Processes of global-local interplay are ... becoming increasingly mediated by telematics" (p.616).

Again, this approach overlooks the opportunities and choices made available by telematics and harks back to theories of technological determinism. However, Dabinett & Graham

recognize a need for more 'locality-based' research into telematics in order to gain a more holistic view of the processes and patterns involved. It is clear that any such research would need to incorporate more of a humanistic behavioural element in its methodology if both sides of the relationship between individual firms and the global information economy are to be more fully understood.

3.2.7 Alternative approaches to the structure-agency debate in ICT impacts research

In their 1991 review of contemporary theoretical debates in human geography, Cloke *et al.* open the chapter on perspectives which seek to bring together the opposing strands of thought on *structure* and *agency* with an observation by Duncan on this subject:

> "The difficulty in constructing a workable theory of action is to avoid on the one hand the determinism of the structural view, and on the other the idealism and hyperindividualism of some non-structural approaches."
>
> (Duncan, 1985, p.178. Cited in Cloke *et al.*, 1991, p.93.)

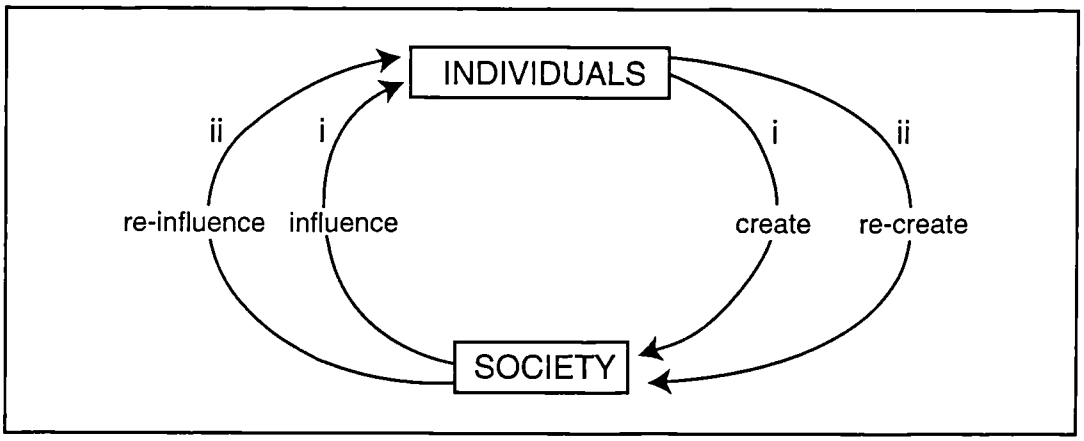
This would appear to be a logical progression of the theoretical debate outlined so far in this chapter. Thus the late 1980s and early 1990s have seen the development of a number of what have been termed 'radical responses' to the failings of the traditional perspectives in ICT impacts research and rural geography as a whole. The most influential and relevant in the study of ICT impacts have been structuration theory (developed by Anthony Giddens), realism (whose most eminent protagonists have been Roy Bhaskar and Andrew Sayer) and, most recently, regulation theory (Amin, 1994; Gibbs & Tanner, 1997). These perspectives have challenged accepted theories and, in particular, have attempted to modify the traditional structuralist approach. Given their importance in the contemporary theoretical debate and their potential relevance in ICT impacts research, this section briefly outlines the underlying philosophies of these alternative approaches and evaluates their application in ICT impacts research to date.

Structuration

In proposing a theory of structuration, Giddens argues that much of structuralism has paid too little attention to the role of human agency. The aim of structurationist theory is to find

some middle ground between the structuralist view on the existence and power of behavioural constraints and the humanist view on the ability of humans to make choices within this environment. In this way, Giddens shows structures to be "*simultaneously both constraining and enabling*" (Johnston, 1986b, p.114). However, an additional important point to be made about structuration is that it was the first and remains the only perspective to both begin and end with the individual (see Figure 3.4). In other words, structuration theory recognizes that individuals have the power to change the wider structures, i.e. the political economy, in the environment of which they are a part (Johnston, 1986a). All other approaches maintain that society is 'antecedent' to the individual, whereas structuration holds that individuals *create* societies which, in turn, *influence* individuals who *recreate* societies.

Figure 3.4 The structurationist view of individual interaction with society



Giddens perceived Marxist-inspired structuralism to be "over-deterministic" and thus attempted to "reconstruct the importance of both structure and agency" (Cloke *et al.*, 1991, p.97). He was particularly concerned that individuals should be represented as knowledgeable 'human agents' who rationalized their actions through this knowledge. His view of society moulded by human agents necessitated the employment of a strong humanistic behavioural element in the methodological approach.

Cloke *et al.* (1991) suggest that one of the key characteristics of the structurationist school is that of 'dualities'- those of structure and agency. Giddens proposes that the only way to merge these two successfully is to recognize, firstly, the *duality of structure* (i.e. that

structures enable behaviour and behaviour can potentially influence and reconstitute structure); and secondly, the *duality of structure and agency* which transcends the dualism of deterministic views of structure and voluntaristic (or passive) views of agency (Cloke *et al*, 1991, p.98 - authors' emphasis.).

The potential importance of structuration theory in studying ICT impacts and rural development is immediately recognizable. A structurationist perspective places the issue of ICT use by rural firms in the context of rural development, fully recognizing the aforementioned importance of the human agency element in decision-making within these firms. Structuration theory integrates this attention to choice and individual decision-making behaviour within a widely recognized need to account for the constraining *and* enabling effects of structures such as institutions, agencies and suppliers. Structuration theory is also a comparatively progressive perspective, continually being updated and modified in response to criticisms (Cloke *et al.*, 1991).

However, a number of points of criticism are of note concerning the practical application of structuration theory (Cloke *et al.*, 1991, p.128-31). Firstly, over-zealous attempts to marry behavioural and structural aspects have led to a "polarity of scale" in Giddens' work. The micro-level of interaction between individuals and the macro-level at the global or national scale are adequately exemplified, but this has been at the expense of the development of meso-scale analysis. Structuration has proved very difficult to translate into empirical research methods due to the way in which it has developed. This throws doubt on whether or not it is of any empirical use or is simply a source of theoretical reference. These criticisms alone render structuration unsuitable as a practical basis for a research methodology in this study of ICT impacts and their rural development potential. However, many of the principles of structuration are extremely relevant to theoretical explanations and may therefore inform the development of a conceptual framework for research.

Realism

Realism represents an alternative modification, or extension, to traditional structuralist theory. Like structuralism, "realism recognizes that individuals make decisions within the

constraints set by economic processes" (Sayer, 1984, p.88). However, in addition, realist philosophy holds that there exists a real world of physical things which are independent of our cognition (Gibson, 1981). Reality is not based simply upon observable events and phenomena (Pratt, 1994). In fact, Bhaskar suggests that some of the most significant components of the real world are unobservable, for example structures, processes and mechanisms (Bhaskar, 1989).

Realist philosophy postulates that, in order to explain why certain things behave in a certain way, it is necessary to examine both their internal structure and the mechanisms and properties which facilitate change in certain circumstances (Bhaskar, 1975. In Cloke *et al.*, 1991). Observable regularities may only be explained "by describing the hidden, but 'real', structures that causally generate them" (Gibson, 1981, p.149). This search for causal mechanisms differentiates realism from traditional Marxist structuralism. What differentiates realism from positivist/neo-classical approaches is its rejection of the search for generalities or regularities as a sufficient end-point to research. Such principles are applied only in the extensive research phase as one component of a broader, more complex research strategy. This is inextricably linked with the perspective's fascination with causation, in that such methods, applied in isolation, would be useless in the search for an understanding of causation as it is not dependent upon the number of times an event occurs (Healey & Ilbery, 1990). In the words of Bhaskar, "a constant conjunction of events is not a sufficient condition for a causal law" (Bhaskar, 1979. Cited in Pratt, 1994.). So, although the aim is not to create categorizations or generalizations, when regularities do occur (through, for example, the use of statistical methods in the extensive research phase) they must be utilized to the full, not as ends in themselves, but "as clues to the existence of particular mechanisms" (Sarre, 1987, p.8).

The complexities of the concepts and terms associated with realist approaches cannot be dealt with here. However, some of the principles of realist thinking should be highlighted as they are used to inform the development of a conceptual framework for research:

1. Realism examines *processes* rather than just *outcomes* in order to try to explain causation/causality (Sarre, 1987). This has particular relevance for this research as the

identification of processes and mechanisms is the key to making informed policy decisions relating to ICT service provision in rural areas and its potential for rural development.

2. Realism recognizes that the decision-making process is affected by both the individual decision-maker (their personal characteristics which predispose certain modes of activity and their underlying motives) and factors directly influencing them (for example, peer pressure). These are termed *necessary* relations, i.e. the process depends on them (Sayer, 1992).

3. Realism recognizes that, despite these necessary relations, the nature of any decision is *contingent* upon the precise situation in which it is made (Sayer, 1992). This allows for the uniqueness of individual firms and the sets of circumstances within which they operate.

4. Realism recognizes the importance of external structures within whose influence decisions are made, and acknowledges the ways in which these structures may empower or constrain decision-makers (Cloke *et al.*, 1991; Sarre, 1987; Sayer, 1992). However, the degree to which these structures influence the decision-making process is not over-emphasized and the power of the individual is therefore not under-estimated.

5. Realism proposes a two-stage research process (incorporating an extensive and an intensive phase - see Table 3.3) in order to distinguish those relationships between factors which are necessary and those which are contingent to the process under scrutiny (Pratt, 1994).

Table 3.3 Sayer's summary of intensive and extensive research methods

	Extensive	Intensive
Research question	• what are the regularities/common patterns? • how widely does a population exhibit certain processes or characteristics?	• how does a process work? • what produces a certain change? • what did the change agents do?
Account produced	• descriptive generalizations (lacking explanatory depth)	• explanations (not necessarily representative)
Methods	**Quantitative Analysis** • large-scale survey of 'representative' sample (through formal questionnaires)	**Qualitative Analysis** • study of individual agents in context (through interactive interviews/ethnography)
Limitations	• representative but unlikely to be generalizable to other situations of time or place • limited explanatory power	• patterns and relations unlikely to be representative • causal powers will be generalizable to other populations as they are necessary features of the objects under study

Source: Table adapted from Sayer (1992), p.243, Figure 13.

Although not fully embracing the realist method due to the limited relevance of many of the more complex features of the philosophy, the complementarity of the two phases of research and their ability in combination to examine the two main aspects of the research topic (i.e. structure and agency) is considered useful and thus elements will be used in the devised methodology.

There are a number of other research strengths particular to realist methods which might be applied to the field of ICT impacts in rural areas.

1. By stressing that real events are inherently contingent, realist thinking suggests that reality can be changed. This is important in looking at implications for policy makers.

2. Bhaskar's transcendental realism offers a theory of knowledge of the structures which generate phenomena/observable events rather than just the events themselves. This can provide more in-depth understanding (Bhaskar, 1979).

3. A realist conception of science is, by virtue of its methods, the most appropriate means by which to study both the structure of societies and the actions of individuals within them (Keat & Urry, 1982).

4. Realism has improved upon a body of work which has been used widely in ICTs research - structuralism - in two important ways. It has impressed upon philosophical thinking the need to incorporate *choice* as a viable option and it has attempted to steer away from the danger of "aspatial theorization" encountered by structuralism (Healey & Ilbery, 1990, p.29).

However, realist theory has had its critics and a number of points which they have raised should be mentioned here.

1. Possibly the most frequently cited criticism of realism is that it is still largely theoretical and has, as yet, been little used in practical application.

2. Problems in interpretation are often cited (for example, Cloke *et al.*, 1991).

3. There is a danger of what Sayer terms "reductionism" in the use of abstract, concrete and synthesis research methods, whereby users "often over-extend them by expecting one type to do the job of the others" (Sayer, 1984, p.216-217).

4. Realist theory has a tendency to be deterministic (Healey & Ilbery, 1990).

5. Realism has also been accused of eclecticism - attempting to compromise between 'pure' philosophies.

In common with structuration theory, there has been little in the way of practical application of realist philosophy in rural geography and none, as yet, in research into ICTs and rural development, although numerous authors (Keat & Urry, 1982; Sarre, 1987; Cloke *et al.*, 1991; Massey & Wield, 1992; Sayer, 1992; Pratt, 1991 & 1994) have tackled the

question of how realist philosophy might be applied in practice. This lack of application to ICT impacts research is probably indicative of the reluctance of ICT researchers to enter the wider theoretical debate (Gibbs & Tanner, 1997; Graham & Marvin, 1996) and the current preoccupation with the information economy thesis.

However, the need to investigate *causality* is recognized by Gillespie in his 1987 paper on telematics and the development of Europe's less-favoured regions, in which he explicitly sets out to examine the evidence of telecommunications problems in less-favoured regions within the context of a conceptual framework. As in most of the ICT impacts literature reviewed for the purposes of this research, the theoretical approach is not explicitly stated. However, Gillespie's concern with causality and its direction is clear in his raising of the debate between the *necessity* of telematics for advanced industrial regions versus the *sufficiency* of telematics to induce economic development. He stresses the need to distinguish between necessary and sufficient conditions for regional development. In addition, Gillespie comments on the fact that "there is very little empirical work, macro or micro, on the regional development impacts of telecommunications investment", most studies tending to use "correlation-type analysis" which does not recognize or tackle the problem of causality and is thus of little use for informing policy (Gillespie, 1987, p.229). Gillespie advocates an approach which examines *processes* at both the *micro level* of individual sectors and enterprises and at the *macro level.* These concepts are of central importance in both realist and structurationist perspectives. There is clear recognition, also, of the ability of individuals to make choices (i.e. the existence of an enabling environment is acknowledged) as well as the potential of policies to change the structures (Gillespie, 1987).

Regulation theory

Perhaps the most recent alternative perspective to have emerged in the field of ICT impacts research is that of the regulationist school. The main proponents of regulation theory in the field of ICT impacts include Gibbs & Tanner (1997) who suggest that the regulationist perspective developed largely in response to the failings of the information economy approaches (e.g. Hepworth, 1989; Goddard, 1991). These are seen by proponents of regulation theory as being descriptive of events, but of failing to adequately examine

processes of change (Gibbs & Tanner, 1997, p.29). One of the major drawbacks of these approaches is that the beneficial effects of ICT use in the economy and society are accepted unproblematically. Regulation theory conceptualizes the cyclical processes of "capitalist growth, crisis and reproduction" in an attempt to integrate "the structural dynamics of capitalism with the institutional forms of society" (p.31). Societal institutions are examined at three levels: the mode of production, the regime of accumulation, and the mode of regulation. Regulation theory describes the concept of the information economy in terms of the transition from Fordism (centred around mass production and consumption and dependent on economies of scale) to post-Fordism. In its concern for general patterns of socio-economic change, the regulation school considers technology as only one of a range of influential elements in this process of change and not as "a *determinant* of economic and social change" (Miles & Robins, 1992, p.14 - original emphasis).

Gibbs & Tanner discuss the application of regulation theory in ICT impacts research in terms of its importance to both *the emergent regime of accumulation* (which is influenced by and in turn influences the development of ICTs) and *the mode of regulation* (which includes both legislative and social regulation and is linked with the liberalization of the telecommunications industry). This, in conjunction with both the geographically uneven demand for telecommunications services and the persistence of British Telecom's monopoly, has led to the spatial differentiation of telecommunications provision. Such geographical disparity holds particular relevance for this research in terms of the potential effects on businesses, organizations and individuals in rural and peripheral areas and, thus, for rural economic and social development.

The merits of applying regulation theory to ICT impacts research in practice, have been discussed with particular reference to urban areas (Goddard, 1994; Gibbs & Tanner, 1997). Goddard, for example, highlights the sensitivity of regulationist thinking "to questions of history and geography", thus compensating for the failure of many previous perspectives to account for factors of space and place (Garnham, 1994) or to examine the outcomes of ICT applications. However, he goes on to suggest that the regulationist "emphasis on a new localism based on networks of flexibly specialized enterprises has been oversold" and that, in fact, the perspective does not offer the ultimate tool for analysis as it does not

adequately account for sociological factors (Goddard, 1994, p.277). Gibbs & Tanner, however, support the need for an approach which balances economic, social and political aspects of ICT impacts. They cite the very fact that the greatest use of ICTs to date has served to intensify the centralization and control of large corporate users as fundamental evidence of the need to better understand the reasons for such developments. To this end, they propose that "regulation theory offers a better understanding of both ... technological and wider economic changes ... and hence a better understanding of the limits to local ICT policies" (Gibbs & Tanner, 1997, p.31).

Garnham's critique of regulation theory holds particular relevance for the research which is the subject of this thesis. His concern over the emphasis on economic structures to the detriment of sociological factors has a bearing in terms of the importance attached by this present research to the very 'human' process of decision-making. The regulationists' dismissal of both technological determinism and the utopian view of ICTs as ubiquitous distance-transcending phenomena is, however, useful. In addition, Gibbs & Tanner's application of regulation theory to the local state sheds some light on the roles which might be played by local authorities and external agencies operating on behalf of businesses in rural areas. The precise application of the local state to this research is discussed in more detail in Chapter 2.

3.2.8 Summary

Overall, this review of the theoretical underpinnings of research into ICT impacts has shown that very little of the literature relating specifically to *rural* areas and *rural* economic and social development has been placed within an explicitly developed conceptual framework. There may be a number of reasons for this, including the fact that there has been a longer tradition of theoretical application in urban geography, compared with that of rural geography. It is also possible that this tradition is related to the comparative proximity of urban geography with economic and industrial disciplines which are grounded in much more scientific empiricism. Clearly, there is now a need to approach the issue of the manifestation of the impacts of ICT adoption in rural locales from a more theoretically informed basis. This is the purpose of the following section.

3.3 A conceptual framework for research

The previous section, in reviewing the various approaches which have been adopted in ICT impacts research, highlighted their merits and limitations. This section first outlines the foci of the research thesis. It then draws on the strengths of theoretical development to date in the field of ICT impacts research, proposing a conceptual framework within which to place this particular study. The chapter concludes that the research topic is most appropriately approached from a broadly humanistic perspective. However, it is proposed that, in order to take into account the wider external factors which affect rural firms and the uniqueness of combinations in which these apply to individual firms, it is useful to draw upon concepts from realism.

The derivation of a conceptual framework hinges upon the identification of a number of levels of interaction within the relationship between ICTs and rural development which need to be understood. These may be considered as the *internal* and *external* environments.

3.3.1 The internal environment

This comprises two areas. The first of these is *the firm* and encompasses such factors as the size of the firm, its turnover and its workforce, the type of product or service produced (i.e. firm characteristics). The second area of influence within the internal environment is *human agency* in the form of the individual entrepreneur or managerial team/management board. As mentioned previously, many of the rural firms in the study area will be very small, i.e. micro businesses employing one or two people, and thus the personal characteristics of the entrepreneur are also of central importance in the internal environment. Entrepreneurial characteristics such as personal perceptions, motives, technological skills and business experience, as well as age, gender, stage in the life cycle and the potential to take risks, are likely to play a crucial role in influencing ICT adoption decisions in these very small businesses. In others, this role may be filled by a management team, or in larger firms partners, shareholders, or a board of directors may hold financial control and thereby influence investment decisions in new technologies. In an independent firm, all these factors will interact at the level of the firm, forming a unique internal environment which shapes the decisions made by the firm. However, if the firm is

owned by a larger company or chain (for instance if it is a branch plant) it may be in a position where autonomy is removed from the firm itself, deferred instead to a higher level. In such cases *choice* may not enter into the equation at all.

The decision-making process comprises a complex interaction of many factors (from both the internal and external environments) within the internal firm environment. It is important to look specifically at the actual *process* of decision-making in order to find out why and how entrepreneurs and management teams make the decisions they do with respect to adoption or non-adoption of ICTs. Decision-making may be thought of as "the translation of motives into overt action within the context of available information" (Walmsley & Lewis, 1984, p.54). "Decisions arise when an individual is motivated to act by changing need or changes in the external environment" (Huber, 1980. Cited in Walmsley & Lewis, 1984, p.54). Decision-making has become more complex as society has become more hi-tech. For the purposes of this research decision-making will be considered at two levels:

- that of the individual (the entrepreneur), and
- that of the organization (the management team).

Decision-making within the firm, regarding the adoption or non-adoption of ICTs, will be in the form of deliberate problem-solving rather than habitual, sub-conscious decision behaviour. At the level of the individual entrepreneur, factors such age, gender, goals, values, perceptions, motivations, stage in the family life-cycle, technical skills and knowledge, and propensity to take risks may all be influential. In addition, the decisions of peers such as friends, neighbours and other local firms may influence the decision-making process. The strategies of external agencies and suppliers will also affect the decision-making of the entrepreneur.

Important underlying mechanisms which affect the decision-making process include the ways in which the entrepreneur searches for information about new technologies - whether this entails an active search or whether the entrepreneur is targeted by the marketing efforts of suppliers or agencies. There is also an important distinction to be recognized between

whether an entrepreneur is *pushed* into adoption of ICTs by external pressures (such as targeting by technology suppliers or the decisions of neighbouring or similar firms) or whether she/he is *led* by internal (personal) factors such as motivations.

In larger firms decision-making will generally be a collective process, derived either democratically by means of a consensus or from the opinions, attitudes and goals of an elite group: the management team. Within organizational decision-making there are two main groups of decision-makers - managers and owner-managers - both of whom have widely differing motivations (Walmsley & Lewis, 1984). Blake *et al.* (1962) constructed a managerial matrix to illustrate the variety of managerial approaches to decision-making, including the following types:

- task management - seek to maximize profits
- country club management - put greater emphasis on non-profit-making concerns
- team management - seek to maximize both personal satisfaction and the monetary success of the business
- impoverished management - de-emphasize profit and other utilities

(Blake *et al.*, 1962. Cited in Walmsley & Lewis, 1984, p.61).

Walmsley & Lewis suggest that it is important not only to look at the management in an organization, but also to study the processes through which decisions are made. They suggest that organization theory throws some light on this process. Organization theory holds that it is the goals of the organization which, although they may differ widely between organizations, always form the basis of the organizational structure and the guiding principle of organizational policy. Walmsley & Lewis conclude that the scarcity of general models of organizational decision-making is due to the fact that the workings of managerial groups are highly complex and individualistic. It is clear, however, that although decisions made by managerial groups will be affected to a much lesser degree by the personal characteristics of the individuals of which they are composed, personal motivations, goals and opinions will still be influential to an extent, dependent upon the individual's status within the group. In common with decision-making by individual entrepreneurs, managerial teams' decision-making will also be affected by external

pressures from agencies, technology suppliers, other firms and wider economic and political conditions.

However, these influencing factors do not, in isolation, constitute a decision-making process as such. The process itself comprises both search behaviour and decision-taking, both of which are affected by influences from both the internal and external environments. External factors and available information are selectively filtered by the personal goals and values of the decision-maker(s) before any decision is made. "Decision-making behaviour is thus guided by a distorted psychological representation of the external environment ... [which] is not innate but 'learned'" (Lewis, 1936. Cited in Walmsley & Lewis, 1984, p.56). The value of a humanistic approach is that it recognizes both the subjectivity of knowledge and the intentionality of individuals. This is vital in examining decision-making behaviour. How this relates to the adopted methodology is outlined in section 3.3.3 and in Chapter 4.

3.3.2 The external environment

The external environment, according to realist epistemology, plays both a constraining and an enabling role in the uptake of ICTs and thus affects the outcome of the adoption process. In addition, the external environment acts at a number of geographical levels - international, national, regional and local. In the case of subsidiary companies or branch plants, it is more than likely that there will also be a 'semi-external' environment embodied in the company head office, which determines the internal operations of the satellite firm to a greater or lesser extent. The external environment comprises what will collectively be termed *external agencies*. These include:

- *institutions* - including organizations concerned with promoting new technologies as part of their overall strategy, for example, local authorities,
- *advisory bodies* - including organizations and agencies providing impartial advice and information to businesses in rural areas (for example, Business Link), and
- *ICT suppliers* - for example, computer companies and telecommunications providers.

Institutions may constrain or enable the uptake of ICTs among rural firms at the various spatial levels mentioned above. At the supra-national level, for instance, European Union policies have promoted the implementation of ICTs through numerous projects funded under programmes such as STAR (Special Telematics Action for Regional Development) and ORA (Opportunities for Rural Areas). However, for the purposes of the development of a conceptual framework for research, it is sufficient to say that such policies have generally created an enabling environment for ICT adoption and use. At the regional and local level, however, there is disparity in EU strategies as they are often area-specific, targeted at designated areas, such as those with Objective 5b status (see glossary).

At the national level, government policies directed through the Department of Trade and Industry (DTI) and the Rural Development Commission (RDC) are likely to be most influential. Prevailing government policy may create an enabling environment through the provision of subsidies, grants or favourable terms for small businesses. However, the process of ICT uptake can equally be constrained by the creation of adverse economic conditions nationally (as an indirect result of government policy) or the imposition of restrictions on funding available for small firms, both of which may discourage investment in large capital items. Telecommunications suppliers are still particularly influential at the national level. Suppliers may be considered to enable the process of ICT adoption by providing the communications infrastructure necessary. However, this is not the case throughout the country. The liberalization of the telecommunications industry has introduced competition and led to companies 'cherry-picking' more lucrative areas, generally core urban areas (Cornford & Gillespie, 1993). This has meant that areas of lower demand have been left lagging behind in both the range and quality of telecommunications service provision. This has particular relevance for many rural areas and is most pronounced in the provision of advanced services such as digital networks like ISDN. Many rural and peripheral areas of the country are still operating on analogue or pseudo-digital exchanges (Gillespie *et al.*, 1995), while "investment in the most advanced communications networks is heavily concentrated in the metropolitan centres of the 'information economy'" (Gillespie & Robins, 1991, p.167). This lack of, or low level of, service is more likely to occur in peripheral and hence rural regions (Bryden *et al.*, 1996;

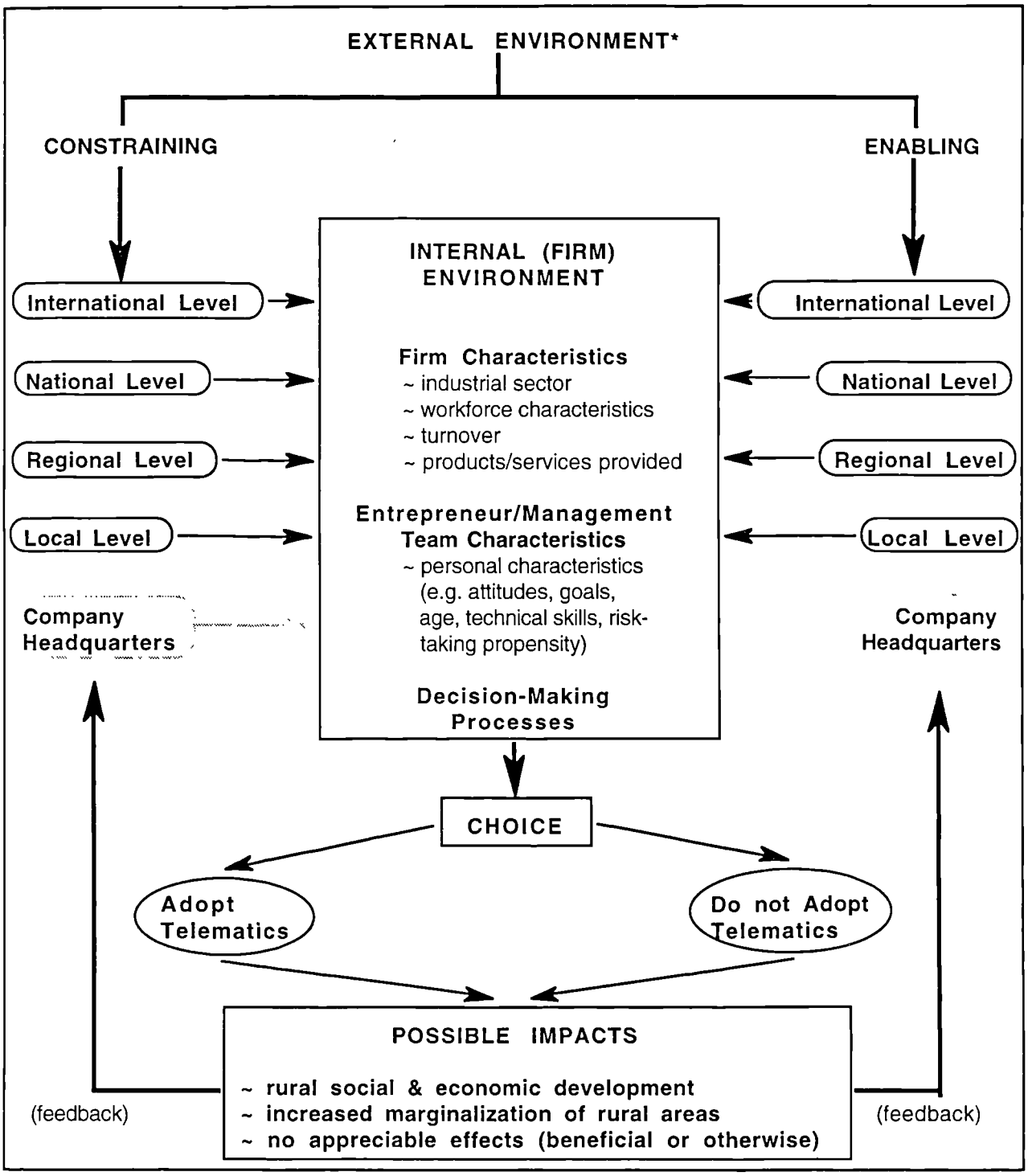
Grimes, 1992). In addition, different suppliers employ different marketing strategies and impose different costs and benefits with respect to provision. These variations are often manifest spatially and are likely to increase with the liberalization of the telecommunications industry (Warnery, 1993).

At regional and local levels, the spatial variation of telecommunication provision is most keenly felt. However, other factors such as keeping abreast of other competitors' technological capabilities and investment come into play, as do the informal networks for obtaining information, such as from other local business people, neighbours and friends - particularly those working in the information technology or telecommunications industries. These informal networks can be highly influential since, as put forward by Rogers in his account of homophily in diffusion theory (see section 3.2.2), individuals often accept more readily information imparted to them from their peers (such as others' experience of using certain equipment or applications) rather than, for instance, 'change agents' (Rogers, 1983). Other factors which become more important at a local level are environmental - for example, accessibility, remoteness and existing infrastructure availability. These may act in an enabling or a constraining manner - i.e. telecommunications are more likely to be adopted by firms in more remote, inaccessible areas through necessity, in order to improve connections to distant suppliers and markets. However, they may constrain decision-makers in situations where telecommunications network investment by an increasingly de-regulated and profit-oriented industry is hampered due to low demand. Whether or not these factors are enabling or constraining will depend on the specific combinations of time and place and internal firm characteristics.

Linked to the provision of infrastructure is the type of rural area. How densely populated or remote a rural area is, its demography (particularly in terms of age and gender composition), whether or not it is a commuter belt and if it is a declining area or an area in which local services, such as shops and post offices, have been retained, are all contingent parts of the whole rural system. As such, their interplaying roles affect the amount and type of business in the area and thus may ultimately influence the potential for ICT uptake by local businesses.

In practical terms, however, with so many factors at work in the adoption and impact process, it is not possible within the confines of this research to examine all the processes and relationships operating within the system. The research therefore focuses on those parts of the system which, it is considered, most directly affect the uptake of ICTs and hence may be instrumental in producing development impacts in the rural economy. These are identified as being the characteristics of the firm's management team or the entrepreneur, the decision-making process (regarding adoption or non-adoption of ICTs) and the interplay of agencies and institutions at various geographical levels in the external environment. In firms which are branch plants, the role of the company head office will also be considered. A schematic representation of the conceptual framework outlining the anticipated interaction between the processes upon which the research focuses is provided in Figure 3.5.

Figure 3.5 The external and internal environments in ICT uptake



Notes: * the external environment constitutes the activities of:
- ~ institutions (agencies, organizations, government)
- ~ suppliers (telecommunications & information technology suppliers)
- ~ macro-scale factors (economic & political climate / capitalism)

denotes possible external influence (only relevant in the case of branch plants)

3.3.3 Progression from theory to method

The research will proceed in a number of distinct stages consistent with the theoretical and methodological underpinnings of behaviouralism and humanism and drawing on the distinction between methodological stages put forward by realist method (see Table 3.3). First, an extensive positivist behavioural research method (i.e. a postal questionnaire survey) will be used to discern the common properties and general patterns of the population of firms in the study area. This is the generalization research phase, examining the outcomes of the ICT adoption decision-making process. The information gleaned at this stage will be in the form of objective facts and will provide basic information about the general population and thus may be used as a sampling framework for more in-depth examination.

The next phase of the methodology examines the nature of the decision-making process and establishes the direction of causality through an in-depth interview survey. This research stage derives its methodology from a humanistic behavioural ontology, consisting of an intensive form of interviewing aimed at key decision-makers in firms purposively selected from the analysis of the extensive survey returns. The sampling process (detailed in Chapter 4) will allow a range of firms to be surveyed intensively: from low to high technology users, and from 'followers' and 'laggards' to 'risk-takers' (Rogers, 1983). The intensive survey uses a semi-structured, in-depth interview format to investigate the nature of causality and the actual connections between various components of the adoption/non-adoption decision-making process. The format of the interviews allows the flexibility to reflect the diversity of firms in terms of ICT use and that of decision-makers in terms of their personal characteristics, perceptions, motivations and decision-making pathways.

This research thus focuses on many factors which are of a humanistic behavioural nature to try to identify the underlying mechanisms which influence adoptive decision-making in the internal firm environment. The intensive survey identifies the causal powers, associated with the decision-makers in rural firms, which influence the decisions that are made. This is an important part of the research as the decisions which are made, in turn, affect the outcomes (i.e. the patterns of ICT use) which result, and it is upon these that the potential effects on rural development ultimately depend. Decision-makers' perceptions of these

rural development effects are also explored in the in-depth interview stage. This is important as it allows the researcher to take account of the range of meanings which decision-makers attach to the concept of rural development. These conceptualizations are of interest because they ultimately shape decision-makers' views on the development impacts of ICT use in their businesses.

The external environment is then examined through a further qualitative research stage, again grounded in humanistic theory. This stage employs in-depth intensive interviewing of agencies involved in rural development and ICT promotion and in providing advice at the various geographical levels outlined in section 3.3.2. The interviews explore factors such as agencies' ICT policies and initiatives within their area of influence, targeting the potential market for ICT products, and incentives and strategies employed to encourage uptake. Agencies specializing in rural development programmes are also interviewed to explore the extent of promotion of ICTs to rural businesses specifically as a vehicle for rural development, and, where possible, to discover the impacts of implementation in rural areas to date. The aim of this phase of the research is to provide a measure of rural development implications from the external agency perspective.

By examining the strategies, policies and perceptions of the business environment held by external agencies, it will be possible to ascertain the underlying mechanisms driving (or indeed constraining) the uptake of advanced ICTs from the external environment, i.e. to discover the determinants of enablement and constraint which act upon the internal adoption decision-making environment of the firm. This analysis (detailed in sections 4.4.1 and 4.4.2) aims ultimately to explain the causes underlying particular decisions. This it does by drawing together the relations between influencing factors, the effects of wider structural mechanisms and the powers of human agency in unique combinations of these conditions in an attempt to show how these relations and mechanisms interact.

Finally, synthesis of the analysis of findings from the three research stages draws together the general patterns of uptake and use of ICTs, the attitudes and motivations of rural decision-makers and the external opportunities and constraints acting upon decision-makers in an attempt to explain how decisions are made and how these link in to wider

economic and social development impacts identified in the rural area. Having defined these decision-making pathways and ascertained the various types of decision-maker which exist, the implications for policy makers and advisory bodies in the external environment may then be outlined. The practical manner in which the methodology is executed and the analysis performed is detailed in Chapter 4.

3.4 Chapter summary

The review of the literature on ICT impacts in rural areas concluded that much of the existing work lacks theoretical rigour and that there has been little account of the role of entrepreneurial decision-making behaviour in the adoption, use and implications of ICTs in rural businesses. As a consequence, this chapter undertook a review of conceptual development in the field of ICT impacts research in order to place this particular research in the context of a theoretical framework. The outcomes of this theoretical review and the conceptualization of the rural development impacts of ICT adoption and use in rural businesses may be summarized as follows:

- theoretical development in the field of ICT impacts research in rural areas has been comparatively deficient and that which has occurred has been predominantly grounded in the technological determinism and information economy schools; thus a broadly positivist approach has prevailed

- conceptualization has been more widespread in research into the impacts of ICT use in urban rather than rural areas

- more recent theoretical approaches to the subject have included structuralist and regulation theory perspectives, but these have over-estimated the constraining nature of wider structural forces in economy and society

- the power of human agency has generally been under-valued and, at worst, ignored

- empirical work in the field has so far overlooked the effects of decision-making processes within small businesses on ICT adoption and use, the overall effects of which

are manifest on a wider geographical scale

- a need exists to explore in depth the nature of the decision-making process which leads to the adoption or non-adoption of ICTs, in the context of rural businesses and the wider structures within which they operate, in order to understand the causes of patterns of ICT uptake and use

- the most appropriate perspective from which to gain such an understanding of human agency is humanism; however, this cannot take into account the causal nature of wider external structures and for this reason, a humanistic perspective must be engaged within a structural framework - elements of realism provide this structural context whilst recognizing the uniqueness of individual firms.

Chapter 4
RESEARCH METHODOLOGY

4.1 Introduction

The previous chapter concluded that there is merit in adopting both positivist and humanist behavioural approaches to the study of Information and Communications Technologies (ICTs) in rural development. This chapter outlines the two stage methodology implemented in this research. In addition, the chapter details the economic, social and geographical characteristics of the study area which render it appropriate for the purposes of the empirical work.

On the basis of the theoretical framework proposed in the previous chapter, a two-stage methodology has been developed, which includes both extensive (or quantitative) and intensive (or qualitative) research methods. The first stage takes the form of an extensive postal questionnaire survey of rural firms in the 'engineering' and 'other manufacturing' sectors to obtain information on their characteristics and to ascertain factual information concerning the penetration of ICTs in the rural business sector. This stage is purely descriptive, revealing the spatial patterns and outcomes of the ICT adoption diffusion process, but lacking explanatory value. The preliminary extensive survey provides results upon which the next stage of the research is based.

The second (qualitative) stage comprises two intensive surveys: one of businesses, the other of agencies in the study area. The business survey involves semi-structured interviewing of selected respondents in the 'engineering' and 'other manufacturing' sectors to obtain information on ICT-related attitudes and opinions of rural entrepreneurs and business people, and on decision-making processes within rural firms. This survey is designed to reveal how the processes of adoption and diffusion of technologies operate within the rural firm population and what produces change in the processes and patterns. The survey also examines the development implications of the uptake and use of ICTs from the point of view of rural entrepreneurs, managing directors and chief executives. The impacts on the local rural economy of the business use of ICTs will also be assessed by looking at its effects on existing local linkages between firms, suppliers and major

customers, local job creation and service provision as perceived by local entrepreneurs/decision-makers and individuals employed within local economic development agencies.

The agency survey is conducted through semi-structured interviews with agencies involved in the promotion of new ICTs in rural areas. This survey investigates the external influences acting upon rural firms and the decision-making processes operating within them in two ways: firstly by examining policies related to ICT promotion in rural SMEs and, secondly, by exploring the views of external bodies on the perceived benefits and drawbacks of ICT use by businesses in the local rural economy.

Only by employing a combined methodological approach such as that proposed in this chapter can the processes operating in the rural business environments (both internal and external) and their resulting outcomes be fully interrogated. Against this background, the chapter aims, first, to outline the progression of the research from theory to method, explaining the reasoning behind the methodological approach chosen; and, second, to detail the practical application of such methods, both in documented research and in this particular work.

In order to meet these aims, the chapter turns first to the use of both quantitative and qualitative research methods, explaining how they relate to the particular theoretical stand-points developed in the previous chapter and evaluating their principal benefits and drawbacks and the effects which these will have on the quality of the data obtained. Practical application of quantitative research methods in the preliminary part of the research is then explained: the selection of the study area, the process of identifying firms for study, the design and execution of the questionnaire survey and the analysis of the data obtained. The subsequent section outlines the implementation of the qualitative phase of the research. Selection of potential interviewees from the respondents to the extensive survey, the design of the interview schedule, the conduction of semi-structured interviews and the methods used to analyse and interpret the information gathered during interviews are detailed. Design, implementation and analysis of the agency survey are then discussed. Finally, the chapter provides a summary of the research stages employed and their links

with the conceptual framework developed in Chapter 3.

4.2 Research Methods

It has been noted that when selecting a research methodology, there are several key choices which must be considered. Bernard (1994) suggests that the question of epistemology (the study of how we know things) is central to this research problem. This involves making a choice between rationalism and empiricism and also between positivism and humanism. Added to this is the question of "strategic choice" (Bernard, 1994, p.1) (for instance, which qualitative technique to use) and, finally, the means by which the technique is used. The humanistic behavioural approach upon which this research is based was detailed in the previous chapter. It emphasizes the importance of human agency and, hence, the need for the use of a methodology which recognizes the intentionality and empowerment of individuals to act. The need to investigate the human process of decision-making, as an integral part of ICT adoption and use, was also highlighted in the conceptual framework (Chapter 3). The processes operating within the environment both internal and external to the firm may only be fully investigated using a combination of quantitative and qualitative methods; the former determining spatial patterns of uptake of ICTs, and the latter discerning the means of operation of the processes which result in these patterns, what influences them and, thus, what affects their outcomes. The origins, applications, advantages and limitations of both methods and their use in combination are the focus of the following sub-sections.

4.2.1 Quantitative methods

Quantitative methods are associated with the positivist paradigm (discussed in Chapter 3) which has been widely applied in geographical research for several decades. Although the subject of much criticism, positivism and quantitative methods still underpin much contemporary research in human geography and have many advantages. Quantitative research is concerned mainly with extracting data which provide an overview of the results or outcomes of processes; in this case, these outcomes are manifested in the patterns of uptake and use of ICTs by rural businesses. Commonly, this type of research involves large-scale extensive surveys of samples which are chosen to be representative of an entire population. It is an effective means of generating data on the characteristics of a

population. In circumstances where no data exist, for example on the uptake of ICTs within rural firms, an extensive postal survey of a population of such firms can provide the required background information (i.e. an overall picture of the pattern of ICT uptake within the rural firm population), on the basis of which a more in-depth study can be carried out. For the purposes of this research, this initial quantitative stage is essential in order to provide up-to-date specific factual information about the rural economy.

There are, however, a number of limitations associated with the use of quantitative techniques and problems arise if data collected in this way are used beyond these limitations. Firstly, there is no account of 'process' other than the outcomes which arise. In other words, there is no explanation of what is actually going on, only description of patterns which result from what is going on. This can lead to the misguided application of patterns across a group or population to which they might not apply. This has been described as "ecological fallacy" and was first identified by Robinson, in 1950, who described it as the "Nosnibor effect" (Bernard, 1994, p.37). What this implies is that when data are collected on a particular unit of analysis it is not then possible to draw from that research conclusions which relate to a different unit of analysis. In terms of this particular research, for example, it is inappropriate and unworkable to draw conclusions about the individuals who make decisions within rural firms from data which were gathered about the firm itself. Thus quantitative methods, although useful, are limited by their lack of explanatory value.

In addition, the misuse of quantitatively-derived data can lead to the inference of causal relationships where they do not, in fact, exist. This commonly happens when the simultaneous occurrence of two variables is taken to mean that one is the direct cause of the other when, in fact, an entirely different variable may be controlling both. For instance, if a number of firms which produce a particular component for the automotive industry are shown to have a high uptake of ICTs in comparison with the rest of the population, it might be inferred that there is a direct causal link between the type of product a firm makes and the potential for that firm to use these services. However, both the weakness of a quantitative method used alone in tackling this issue and the true nature of causality are highlighted when the results of a qualitative survey emerge. The factor

found to be the main causal mechanism behind the higher level of ICT uptake may be an external pressure from the major automotive companies who are the major customers of these smaller firms and who insist that rural firms wishing to supply them are obliged to adopt certain advanced telematic means of communication. A separate external factor is found to be responsible for the high uptake of ICTs among a specific group of rural firms. Such links between cause and effect cannot be identified through the use of quantitative methods alone.

In summary, however, quantitative methods provide a valuable means of gathering factual information concerning populations about which little is known. They allow this to be done on a wider scale than other methods and are thus ideal for exploring the general characteristics of the rural firm population across the study area. The specific ways in which a positivist methodology is used in practice for the purposes of this research are detailed later in this chapter. Data derived quantitatively form the basis upon which qualitative work may be undertaken; methods employed by qualitative researchers are the subject of the following section.

4.2.2 Qualitative methods

Qualitative methods represent the antithesis to quantitative approaches. Whereas quantitative methods are associated with the positivist school and produce data which are indicative of outcomes, qualitative methods represent a more humanistic approach, shedding light on the ways in which outcomes arise. In other words, they provide an insight into the processes in operation. The term 'qualitative research' has been defined as "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (Strauss & Corbin, 1990, p.17). The aim of qualitative research is "to **purposefully** select informants (or documents or visual material) that will best answer the question" (Creswell, 1994, p.148 - original emphasis).

According to Merriam (1988) qualitative research is based on a number of assumptions:

- the researcher is concerned with process rather than outcomes
- the researcher is interested in meaning and how people make sense of their lives and experiences

- the researcher is the primary instrument of research through which data are filtered (this is in contrast to filters such as questionnaires used in quantitative methods)
- the research involves fieldwork where human behaviour is observed and recorded in its natural setting
- the research is descriptive and promotes understanding of process and meaning
- the research process is inductive, the researcher building concepts and theories from details.

These assumptions add value and depth to the data obtained through qualitative methods, particularly in terms of understanding how things work and in gaining an insight into human behaviour. In addition, qualitative methods also offer the researcher the opportunity to be flexible in the research. This means continually developing the research technique as the fieldwork itself progresses, incorporating into future work the experience and understanding which have been gained from past work.

Furthermore, qualitative methods differ from quantitative methods in their concern over what Silverman describes as 'authenticity' rather than reliability. "The aim is usually to gather an 'authentic' understanding of people's experiences and it is believed that 'open-ended' questions are the most effective route towards this end" (Silverman, 1993, p.10). Thus qualitative research typically involves smaller samples where the aim is to gain an in-depth insight into people's experiences without generalizing findings up to the level of an entire population. For this reason, qualitative methods have been widely used throughout the social sciences.

There are a number of stages involved in qualitative research: collection, analysis and interpretation of data, and the reporting of results (Strauss & Corbin, 1990), all of which are open to broad variations between researchers and research. Data collection in qualitative research may be in the form of "observations, interviews, documents or visual images" (Creswell, 1994, p.149). Table 4.1 provides an overview of the main features of each of these techniques and a brief summary of their advantages and limitations.

Table 4.1 Qualitative data collection techniques

Technique	Options	Advantages	Limitations
Observations	⇒ researcher's role as participant &/or observer can vary	⇒ first-hand experience & ability to record information as it occurs ⇒ good for sensitive topics	⇒ can be intrusive ⇒ quality of researcher's observation skills is crucial
Interviews	⇒ face-to-face (one to one or group) ⇒ by telephone	⇒ allows researcher control over questioning ⇒ useful when informants cannot be observed	⇒ information is filtered through informants' views ⇒ researcher's presence may induce bias in responses
Documents	⇒ public (minutes or newspapers) ⇒ private (journals, letters or diaries)	⇒ researcher can obtain unobtrusively informants' language & words from something into which they put a lot of thought	⇒ may be protected ⇒ may be difficult to find ⇒ may be inaccurate or inauthentic
Audiovisual materials	⇒ photographs ⇒ films ⇒ art ⇒ videotapes	⇒ visually creative ⇒ an unobtrusive means of data collection which allows informants "to share their reality"	⇒ access & interpretation may be difficult ⇒ observer's presence may be disruptive, affecting responses

Source: Modified from Table 9.3 (Creswell, 1994, pp.150-151). Original material from Merriam (1988) and Bogdan & Biklen (1992).

The technique chosen as most suitable for the purposes of this research is semi-structured interviewing. There are several reasons why this method is particularly appropriate. The need for specific information about a limited topic in the form of opinions, attitudes and explanations lends itself most readily to the interview format, whereby it is possible for the researcher to retain a moderate amount of control over the information imparted. Moreover, the type and depth of information sought as a result of the decision to follow a humanistic behavioural approach necessitates direct interaction between researcher and informant. Furthermore, the positions occupied by those individuals who were to be interviewed meant that there would be many competing pressures on their time. Giving an impression of efficiency and competence was thus considered to be essential to the researcher's credibility and to obtaining useful data:

> "semi-structured interviewing works very well in projects where you are dealing with managers, bureaucrats, and elite members of a community - people who are accustomed to efficient use of their time. ... It shows that you know what you *want* from an interview ... that you are prepared and competent, but that you are not trying to exercise excessive control over the informant."
>
> (Bernard, 1994, p.209-210).

The semi-structured interview format is an ideal means of obtaining this type of information in such circumstances when there is only one chance to interview the individual, as it combines

> "much of the free-wheeling quality of unstructured interviewing, and requires all the same skills, but semi-structured interviewing is based on the use of an interview guide [*or schedule*]"
>
> (Bernard, 1994, p.209-210).

Analysis of qualitative data may be carried out successfully while simultaneously interviewing and transcribing. This fosters reflexivity in that findings emerging from qualitative data during transcription may be incorporated into the ongoing research, thus allowing a continuing development of the research technique in order to obtain data on subjects/themes of particular relevance to the topic under scrutiny. Wolcott splits the all-encompassing process of data analysis into three components - description, analysis and interpretation. Firstly, through *description* it is possible, with data such as will be collected from this research, to stay close to the original dialogue as it is recorded and transcribed, extracting large portions 'word-for-word' and allowing these to "speak for themselves". This has limitations, however, and Wolcott highlights the danger of this "the-answer-must-be-in-there-somewhere" approach in leaving too much work to be done by the reader (Wolcott, 1994, p.13).

Secondly, *analysis* takes the dissection of the data one step further than a simple description of what is found. It is a systematic, methodical and logical process, identifying specific features and the relationships between them. Analysis provides a means of segmenting large amounts of amorphous data in order to make them more manageable. Techniques involved in analysing qualitative data include the identification of regular patterns, comparison between different cases (or interviews) and evaluation (i.e. comparison with a 'standard' case (Wolcott, 1994, p.33). Another strategy is to refer findings to previously documented work.

Finally, *interpretation* provides even more insight into the data, facilitating the derivation of meaning from the results of analysis. Being somewhat juxtaposed to analysis in apportioning more freedom of the researcher in personal judgment of the possible implications, Wolcott describes the essential features of the interpretation stage as being of a "free-wheeling, subjective and generative" nature, promoting "imaginative and inspired" thinking (1994, p.23). Interpretation is not so traditionally scientific in the positivist sense, being aimed primarily at the achievement of a greater depth of understanding of the data and what they mean. There is an inherent danger that interpretation can become too speculative and hence it is vital that a strong focus is maintained. This may be achieved by adhering closely to the proposed theoretical framework in the identification and examination of themes within the data. However, interpretation of data inevitably results in the reworking of some conceptual propositions as new angles on the processes under research are revealed. Further development of the proposed conceptual framework, as a result of analysis and interpretation of the data, constitutes a vital stage of the research process.

It has been suggested by researchers such as Limb (1994) that there are two basic ways to approach the analysis and interpretation of qualitative data. Firstly, a *"bottom-up"* or inductive method whereby listening to and categorizing the main themes emerging in the data provide the means by which order and understanding may be achieved. It is possible to look for similarities and differences between cases. The idea is to generate upwards from the empirical work, building up a structure based upon the main principles. Here it is feasible to gather together all the comments made about a particular event or topic, cutting and pasting to enable comparisons. However, it is essential to keep returning to the original context of such statements in order that the true meaning is not lost.

Strauss & Corbin (1990) suggest that, in qualitative data analysis, the researcher is primarily concerned with accurately describing what she/he has understood, reconstructing the data into a "recognizable reality" for the people who have participated in the study (p.122). They identify a coding strategy which aims to avoid the loss of context in the dissemination and reduction of data. Firstly, "open coding" which encompasses the "breaking down, examining, comparing, conceptualizing and categorizing" of data in order

to identify themes and concepts (p.61). Following this, "axial coding" may be performed in which coded data are "put back together in new ways after open coding, by making connections between categories" (p.96). This method of coding involves contextual, strategic and consequential considerations which lead to a holistic treatment of the coded data. The precise manner in which this coding was performed on the data obtained in the field is described in detail in section 4.4.1.

Secondly Limb's *"top-down"* technique may be employed which involves interrogation of the data in order to provide evidence for concepts or perspectives extracted from the literature and the theoretical work. In this way data may be used to support or contest established theories or concepts and those developed at an earlier stage of the research. The theoretical work, or conceptual framework, provides the main focus for the analysis performed for the purposes of this research. As will be shown in more detail in section 4.4, the design of the interview schedule is based closely on those concepts put forward in Chapter 3 as being of most direct relevance to shaping the processes of adoption and uptake of ICTs in rural businesses. The analysis, in turn, closely follows the format of this interview schedule, dissecting the data thematically in order to examine links between themes covered during the interviews and to explore the nature of causality in the process of ICT adoption.

In Limb's opinion, it is essential to follow through the analysis and interpretative processes in both directions since it is important not just to look for what it is hoped or expected will be found. The importance of the creation and testing of a theoretical basis is unquestionable and it is also imperative that purely descriptive techniques are not used in isolation. Strauss & Corbin (1990) propose that the interpretation of qualitative data involves "description, recognizing that some interpretation is necessarily involved in the data analysis process and in selecting the research outcomes that eventually will be reported" (p.122). Belenky (1992), however, describes the process of gleaning the salient information from qualitative data as an "interpretive-descriptive" approach; description is the primary aim of qualitative analysis, but some of the interpretations found in descriptive research suggest an interest in theory building (cited in Maykut & Morehouse, 1994, p.122). In the case of this research, the qualitative stage of the empirical work is designed

to examine in depth, and subsequently inform, the theoretical framework upon which it is based.

4.2.3 Combining quantitative and qualitative research methods

Quantitative and qualitative approaches have been successfully combined in previous studies in human/rural geography (see Chapter 2). However, the tradition of combining research methods or using "multimethod research" (Brewer & Hunter, 1989) is more established in the social sciences. Brewer & Hunter suggest that there are a number of advantages for theoretically oriented research of using multimethod research:

1. "Theories do not respect conventional methodological boundaries ... employment of multiple research methods adds to the strength of the evidence."
2. "Methodological replication" can result in increased vulnerability to method-specific errors; multimethod research provides a means of mitigating against this.
3. Methodologies are often specific in terms of the objectives they can achieve; the use of multimethod research can allow the accomplishment of a broader range of research objectives.
4. Various methods have different strengths and weaknesses and so each method used may benefit from corroboration of findings by the use of another method.
5. It is often the case that the optimal method of research for a particular topic is not feasible; in this case multimethod research can provide the next best option, rather than the use of a single research method which, alone, is significantly less able to achieve the research objectives.
6. "Employing different types of methods helps to guard against and to correct for inherent methodological biases either for or against certain types of theories"

(Brewer & Hunter, 1989, pp.48-54).

Creswell cites a number of ways in which more than one research method might be used within a single study:

1. *triangulation* whereby possible bias in a method may be ruled out by using different methods to try to achieve the same results
2. *complementary* whereby different methods can highlight different aspects of phenomena

3. *developmentally* whereby the first method informs the second
4. *initiation* whereby new perspectives can emerge through the use of a different method
5. *expansion* whereby a combination of different methods broadens the study

(after Creswell, (1994) p.175).

The implementation of a combination of approaches in this research is primarily an attempt to use the first method, the quantitative postal questionnaire survey, to discover the patterns upon which the second research method/stage may be based, i.e. the developmental argument. The complementary, initiation and expansion arguments are also very much central to the rationale for combining the two approaches.

Brannen (1992), in discussing the merits of combining research methods, refers to the main distinctions between the quantitative and qualitative paradigms:

> "The qualitative researcher is said to look through a wide lens, searching for patterns of inter-relationships between a previously unspecified set of concepts, while the quantitative researcher looks through a narrow lens at a specified set of variables." (p.4).

This is not to say, however, that one method is necessarily inferior to the other, rather that each has a particular way of looking at the world and can thus provide a different type of information relating to the research topic; i.e. research methods can be complementary. The complementary aspect of the combined method used in this research allows the outcome of the process of ICT adoption to be highlighted by quantitative methods, while the qualitative methods highlight the processes behind these outcomes, the causes of the patterns in diffusion of technology in the study area.

The initiation aspect of the research is demonstrated by the way in which, by using a combination of approaches to the research topic, the researcher hopes to both test the current perspective and discover new ways of approaching it. The expansion argument is also upheld in this particular research; the quantitative methods facilitate a factual perspective while the use of qualitative methods allows exploration of opinions, perspectives, motivations, goals and other more subjective characteristics of decision-makers.

Triangulation is not applicable in the case of this research given the differences in the types of data obtained through the two methods used. The extensive nature of the data obtained via quantitative methods means that it would be impractical in terms of time and resources to qualify the results of the quantitative stage using qualitative methods.

In summary, the combination of methods applied in this study both strengthens the research argument and broadens its scope. In addition it supports the humanistic behavioural perspective, which underpins the research, by incorporating a substantial investigation of human agency. The following section details how the combination of these methods in practice aided the construction of a picture of ICT adoption in rural businesses.

4.3 The extensive survey

The rationale for conducting an extensive survey stems from the need to find out more about the types of rural businesses which are to be found in the study area. The fact that most of the rural firms in question are extremely small means that very few in the study area are listed in national business databases such as the Dun & Bradstreet Index. Thus it is necessary to glean the type of information which would normally be found in such publications through an extensive postal questionnaire survey of these firms. Most importantly, however, the extensive survey is invaluable in finding out about the levels of ICT uptake within the small firm population. This information is central to the research and is not available through any other source - hence the necessity of doing an initial survey.

The extensive survey also provides information which is suggestive of *indirect* explanations as to how and why ICTs are adopted and used by rural firms. For instance, information relating to the size of firms, their length of occupancy, the type of products they make and their range of use of ICTs can provide indirect evidence which points to reasons why firms might take up new technologies. What the extensive survey cannot do is provide *direct* explanations for the patterns of technology uptake among the respondent population; this is only possible through direct observation or questioning of the

individuals involved in the decision-making processes with respect to technology adoption.

4.3.1 The study area

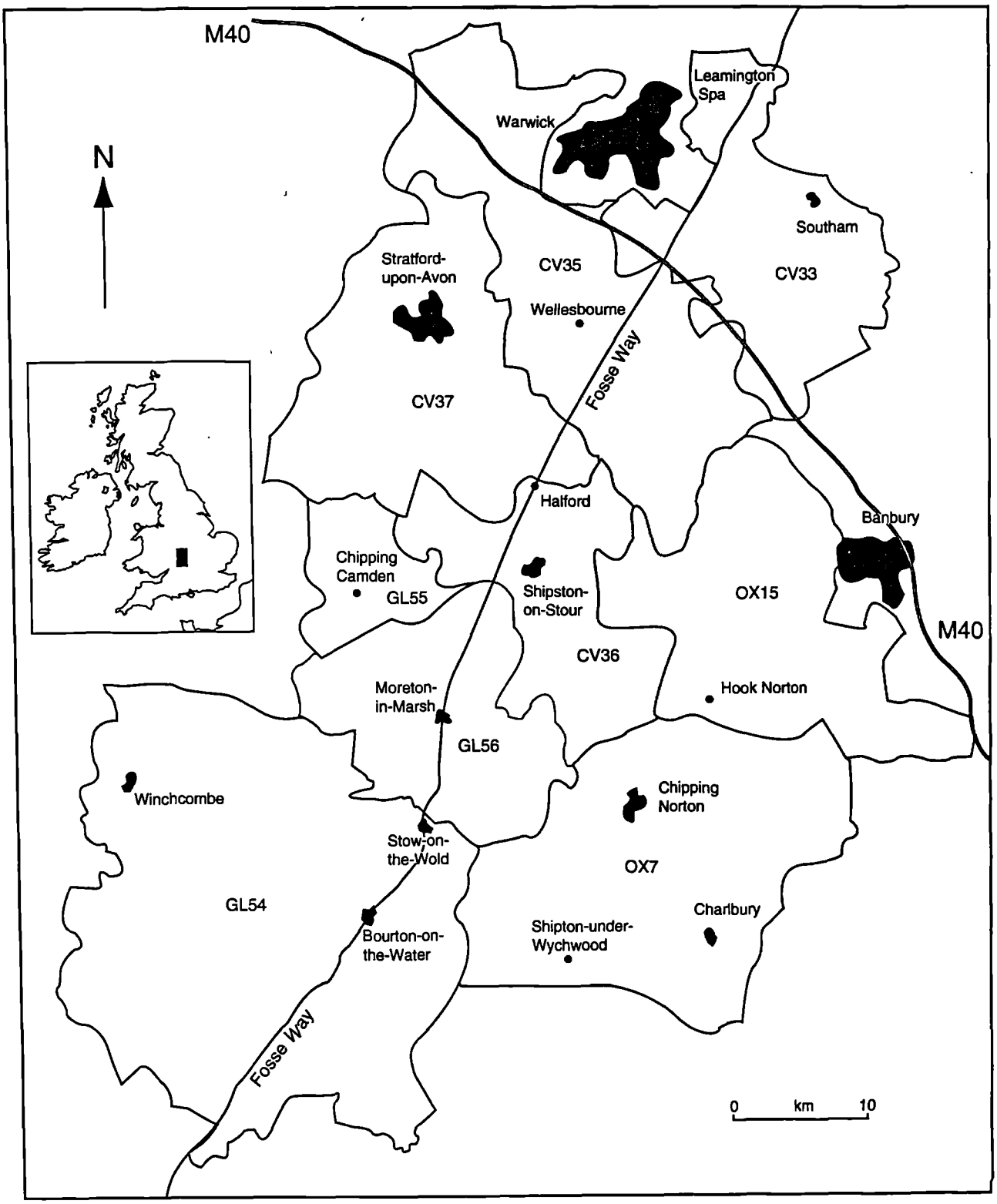
The study area comprises the accessible rural parts of south Warwickshire, Oxfordshire and Gloucestershire. It was decided to define the study area by post code districts in order to facilitate the selection of firms in the area from existing sources of information, such as databases held by local authorities. These are discussed in more detail later. The south Warwickshire post code districts of CV33, CV35, CV36 and CV37, the Cotswold post code districts of GL54, GL55 and GL56 and the West Oxfordshire and Cherwell post code districts of OX7 and OX15 were designated as defining the area from which firms for study would be selected. A post code district map was obtained from Geoplan which enabled precise definition of the boundaries of the above post code districts and hence accurate selection of firms in the designated study area. The appropriate extract of this map covering the villages and rural areas sampled is reproduced in Figure 4.1. This choice of districts allowed the larger towns in the vicinity, including Banbury, Cheltenham, Cirencester and Leamington Spa to be excluded from the research, preserving the rurality, and hence the uniqueness, of the study. For this reason, the only large market town which lies within the study area as defined by post code districts (Stratford-upon-Avon in Warwickshire - CV37) was also excluded from the research.

The area was considered suitable for this particular research for several reasons. Firstly, according to Keeble's typology of rural areas (1980), it is an *accessible* rural area. In other words, despite being genuinely rural, the area is advantaged by its proximity to major urban centres; in this case London and Birmingham. It is also well served by communications networks, both in terms of transport and access and in terms of telecommunications availability. Part of the area in south Warwickshire (CV33 and CV35) is dissected by the M40 motorway which then extends along the north eastern edge of Cherwell District (OX15). The Fosse Way also dissects a significant part of the study area, namely south Warwickshire (CV33, CV35 and CV36) and Gloucestershire (GL56 and GL54) (see Figure 4.1). All the major telecommunications companies (for example, BT, Mercury, Vodafone and Cellnet) provide coverage in the area. This means that, in theory at least, ICTs are uniformly available throughout the study area and thus disparities in the

availability of ICTs as determining factors in the formation of spatial patterns of uptake and use can be ruled out and the research can focus on entrepreneurial characteristics, decision-making processes and constraints such as costs.

Secondly, an additional characteristic of the area which makes it particularly suitable for this research is the spatial pattern of settlement and industry. The area is one of dispersed small settlements, the largest being Southam (Warwickshire, CV33) with a population of 6716, Chipping Norton (Oxfordshire, OX7) with a population of 5311 and Wellesbourne (Warwickshire, CV35) with a population of 5177 (Census, 1991). Industry within the area is also relatively dispersed in single site locations and small village 'industrial parks', thereby contrasting markedly from the concentrated patterns of industry found in urban centres and peri-urban industrial estates. This dispersal of firms enhances the importance of effective communications, presumably increasing the potential need for ICTs and thus emphasizing the appropriateness of the area for research of this nature.

Figure 4.1 The study area delimited by postal code districts



Thirdly, the area chosen for this study lends itself particularly well to the sectorally specific aspect of the research due to its prevailing economic conditions. The area as a whole is relatively prosperous with manufacturing and engineering sectors well represented. It is thus feasible to study the diffusion of technology among small firms in these sectors and the prosperity of the area means a steady influx of incomers (both in terms of individuals and firms) which is traditionally a catalyst to the diffusion of innovations. In Warwickshire, some local agencies have suggested that there is an over-reliance on the engineering sector. However, the south of the county has a high degree of self-employment (particularly in marketing, promotion, IT and software industries) and thus the emphasis of this research on small businesses is likely to be satisfied in this area. South Warwickshire also benefits from the multiplier effects of a thriving tourism industry and, overall, Stratford-on-Avon and Warwick Districts are among the top performing local authority districts in the West Midlands region. Warwick District is listed among the top 25 districts in the UK in terms of economic growth (CWP, 1995, p.6). Oxfordshire has high rates of new firm formation and survival; research has shown that the county's employers in the size band 20-199 employees had one of the highest employment growth rates in England and Wales between 1992 and 1995 (HOETEC, 1996, p.6). Oxfordshire has, in common with national trends, seen a decline in the manufacturing sector. However, the rate of decline in Cherwell District, incorporated in the study area, has been less than half that of the county as a whole (Cherwell District Council, 1996, p.6-7) with manufacturing and engineering sub-sectors such as metal manufacture, printing, publishing and the automotive industry well represented. This relative prosperity in these sectors further reinforces the appropriateness of the area for this research. Gloucestershire has, on average, an over-representation of manufacturing sector employment, but the Cotswold District has below the national average percentage of employees in this sector (Cotswold District Council, 196, p.23). It is thought that this is related to the over-reliance on the now declining defence and aerospace industries. However, the long tradition of employment in these industries has built up a local pool of skilled labour and the trend in larger industries suffering redundancies has encouraged a significant level of new start-ups in the SME sector as skilled individuals have gone into self-employment. Thus the area is rich in entrepreneurial propensity, making it an ideal setting within which to study entrepreneurial decision-making with regards to ICT take-up and use.

Finally, previous research has shown that, in the study area, the sectors upon which this research focuses have shown considerable potential to accept readily and benefit from the use of telematics technologies (Berkeley *et al.*, 1996; Clark *et al.*, 1995; CLED, 1993; Ilbery *et al.*, 1995). It is thus appropriate that this area should be surveyed in-depth to examine more fully the possible future rural development implications of ICT uptake in rural firms.

4.3.2 Selection of firms for study

Analysis of the results of the European Union's SARBA project (conducted under the Fourth Framework Programme), which examined levels of telematics use within SMEs (small and medium-sized enterprises) in Lancashire and Warwickshire, showed that the firms most likely to take up and benefit from new telematics technologies included those in the engineering and manufacturing sectors. Hence this research focuses upon these identified sectors. For the purposes of empirical work, it is therefore necessary to select firms defined by industrial sector - i.e. by their SIC (Standard Industrial Classification) number. Table 4.2 shows the SIC groups from which firms were selected for this research with examples of the sub-groups into which these firms fall.

Table 4.2 Examples of SIC groups selected for the business survey and some of the sub-groups represented in the surveyed population

Order Group	Description
Engineering 3xxxx	
32833	Pneumatic control equipment
32841	Refrigerating machinery
35300	Motor vehicle parts
37100	Measuring, checking & precision instruments
Manufacturing 4xxxx	
41502	Other process & preserving (food)
46300	Builders' carpentry & joinery
46711	Upholstered furniture
46712	Other wooden domestic furniture
47500	Printers/Publishers
48360	Plastics Products N.E.S.

Source: Dun & Bradstreet Ltd - UK SIC Codes

The sampling frame applied in the extensive research stage was designed with the aim of surveying as many firms as possible within the study area as the total population of firms was estimated to be relatively small. This limited population of firms is a function of the rurality of the area and the dispersed nature of its settlement pattern. The difficulty in obtaining data on very small firms which are typically found in rural areas has already been highlighted and there is no single accurate source of finding this type of information. For this reason, a number of sources had to be used to locate these firms. The reliability of these sources is likely to vary in terms of how up-to-date and comprehensive they are. However, all were found to have been updated within the year preceding the extensive survey. This ensured a measure of standardization and meant that there was less likelihood of firms having ceased to trade during the time which elapsed between their being recorded in the databases and their being contacted for the purposes of this survey.

The following sources were used:

1. The relevant volumes of the Yellow Pages (namely, 205 - Oxford, 221 - Coventry, 228 - West Midlands South and 294 - Gloucester) were searched for firms in the relevant industrial sectors and having a post code locating them within the limits of the study area.
2. Warwickshire Chamber of Commerce compiles a list of *Warwickshire* firms - this was searched by post code district and firms not falling into the two industrial sectors of concern (by SIC number) were omitted.
3. Oxfordshire County Council holds a database of *Oxfordshire* firms which does not discriminate by firm size (in terms of number of employees), but could be searched by post code district and by SIC number (Standard Industrial Classification).
4. A Leamington-based research company Sales Performance Analysis (SPA) provided a list of *Gloucestershire* firms from a database search by post code district.

It should be noted that the extensive survey aimed to reach as many firms as could be located through the various avenues pursued. It is not possible to estimate the proportion of the total population of firms which lie within the study area to whom postal questionnaires were sent as, although most local authorities produce economic profiles

which provide information pertaining to numbers of businesses operating in their areas, these areas do not correspond with post code districts and are thus incomparable with the geographical area covered by this study. Such estimation is further complicated by the fact that the research omitted those businesses located in the larger market towns in the area.

4.3.3 Questionnaire design

The questionnaire was designed to derive mainly factual information about the general characteristics of businesses in the study area - the type of information which would normally be found in published business databases. Information about the current penetration of ICTs among the small firm population was also required. However, the questionnaire also had to obtain some indication of potential levels of ICT uptake in the future - information which is not strictly factual, as it depends partly or wholly on personal opinions and perceptions and is projected and thus may be subject to change. The questionnaire was constructed in two distinct sections. The first contained questions concerning the characteristics of the firm (e.g. ownership type, year of start-up, workforce size and dynamics, products and/or services supplied and customer and supplier linkages). The second was composed of questions pertaining to the availability of ICT equipment and services at the site, sources of information and advice on information technology, telecommunications and ICTs, and possible future needs of the firm in terms of advanced ICT services such as EFT (Electronic Funds Transfer) and E-mail.

Details of firms provided by the database searches (described in section 4.3.2), including address details, telephone numbers and SIC numbers, were entered into a spreadsheet in Microsoft Works Mailmerge Package. This software enabled the addresses of individual firms to be printed on the questionnaires and covering letters, which were also produced using this software. It was felt that, due to the nature of the population under research (i.e. professional people in managerial positions), the more professional the questionnaire looked, the greater chance of achieving a good response rate. The questionnaire is found in Appendix 4.1.

A pilot survey of twenty firms in the study area was conducted in order to test the usability and effectiveness of the questionnaire. Out of these twenty, nine questionnaires were

returned. Eight provided useful responses and one firm had ceased trading. On examination of the responses, the questionnaire was found to work well with only one minor modification considered necessary. The numbering of questions was modified so that those who did not own or use a computer only had to leave out one question (i.e. the current Question 13 was formerly three separate questions). The intention was that if the questionnaire was made more simple to negotiate it would produce more valid answers. The only other change made was to the covering letter, to which a phrase was added which stressed the relevance of all firms to the research, even the smallest. It was suspected that, from the response to the pilot survey, some of the smallest firms did not return the questionnaire due to a preconception that their small size meant that their answers would not be of use. The questionnaire was first sent out in December 1994, accompanied by a covering letter explaining the purpose of the research and stressing the confidentiality of replies.

Replies were recorded in the Microsoft mailmerge spreadsheet as they were received so that those firms from which questionnaires had not been returned could be identified for the purposes of a follow-up mailing. Four weeks after the first mailing the process of mailing questionnaires was repeated for those firms from whom replies had not yet been received. This second questionnaire was accompanied by a follow-up letter which again stressed the importance of all firms to the research, regardless of their level of ICT use. This was considered necessary as a result of some remarks made by respondents who returned their questionnaires unanswered after the first mailing; they confirmed that a certain part of the small firm population, including many of the firms who did not yet use or ever plan to use advanced ICTs, felt that the questionnaire was not applicable to them or that their responses would not be of any use to the project.

The overall response rate after two mailings was comparatively high for surveys of this kind at 42%. Response rates are often in the range of 20% to 30% (Bernard, 1994). Table 4.3 provides details of the scale of the survey and the response rate. The response rate takes into account the usable replies only, discarding those questionnaires which were returned from firms which were not classified in the engineering or manufacturing sectors.

Table 4.3 Extensive survey details

	Number	%
Questionnaires sent out	310	100
Questionnaires returned	156	50
Useful responses (i.e. response rate)	129	42

4.3.4 Analysis of results

Information obtained from the postal questionnaires was coded and entered into a spreadsheet (see Appendix 4.2). Coding is the means by which responses may be transformed into numbers in order to search for patterns within the data (Bernard, 1994). The coding scheme derived directly from the format of the questionnaire and was designed to retain as much of the detail within the data as possible. This is important, as once data are reduced and the detail is lost it cannot be easily expanded again without going back to the original questionnaires which is time consuming. Bernard suggests that, in contrast with the rules which apply to coding qualitative data, "the rule for quantitative data is: *Don't do data analysis until you've got data*, and data in this case means numbers" (original emphasis); he suggests making these codes "as verbose as possible" (p.394). In practice, this means that, rather than immediately reducing variables such as that produced by Question 7(a) "How many people are regularly employed here full-time?" into categories or groups of numbers, the response is first entered directly into the spreadsheet as the actual number given by the respondent. At a later stage, the entire range of data values can then be viewed and the most appropriate categories into which they should be broken down may be decided upon, considering both the spread and clustering of the data. These categorized codes are then entered into the spreadsheet as extra columns. Appendix 4.2 provides a detailed breakdown of the way in which the questionnaire responses were coded and the variables named.

The software used to store and manipulate the data was Statistical Package for the Social Sciences (SPSS) for Windows, as this enables the execution of a range of statistical analyses and graphical representation of the results. However, for the purposes of this research, the calculation of frequencies and cross tabulations provided a sufficient insight into the outcomes/patterns of the process of diffusion of ICTs among the business population to enable selection of individual firms for further investigation in the intensive

research stage. Statistical tests such as Chi-squared were not considered feasible owing to the relatively limited size of the data set once broken down into a number of categories.

The next stage of analysis was simply to look at the data, picking out patterns and getting an overview of the spread of businesses in terms of their general characteristics and their use of ICTs. At this point, with the general overview in mind, it was possible to impose categories on certain variables, producing further codes. These new variables were named appropriately so as to link them to the original variables from which they were derived, while at the same time distinguishing them significantly from the source variable. This further categorization and coding is exemplified by the variable originally created to describe the number of full-time employees regularly employed by the firm (refer to Table 4.4). This response was first coded as EMPFT - the actual number of employees as reported by the interviewee. At a later stage the range of answers for this question were examined and it was decided to code these as a new variable EMP1 which contained the original data (variable EMPFT) grouped into categories.

The next stage involved transforming the data into frequency distributions and the calculation of cumulative frequencies for variables. Cumulative percentage figures were also calculated. These parameters allow patterns of variability in the data to be identified. This has two main purposes. Firstly, it allows the researcher to identify those variables which do vary and thus those which warrant further investigation. Secondly, it provides an indication of those variables which vary too much and thus need to be "collapsed" (Bernard, 1994, p.407). This further collapsing is exemplified in Table 4.4 where column three (headed SIZE1) shows the groups into which the variable EMP1 were subsequently recoded again (into new variable SIZE1 - to denote size of firm by full-time employees). This was necessary for the purposes of cross-tabulating the data as some of the groups in variable EMP1 still contained too few cases for further analysis.

Table 4.4 Re-coding variables

EMPFT	EMP1	SIZE1
0	0	0
1	1	1
2-5	2	2
6-10	3	3
11-15	4	4
16-20	5	5
21-30	6	6
31-40	7	6
41-50	8	6
51-100	9	7
101-200	10	8
201-400	11	8
>400	12	9

The final stage of the analysis of the extensive survey involved testing for relationships between variables. In the case of this research, this involved cross-tabulation of variables. This was carried out in two 'directions'. First, those variables which, on the basis of the theoretical framework, were considered to be likely to vary in conjunction with one another (i.e. to be somehow related) were cross-tabulated in order to test these assumptions. Then variables which, on the basis of the frequency and percentage calculations carried out in the previous stage of analysis, were observed to vary were cross-tabulated to discover with which other variables they appeared to co-vary. As previously mentioned, the limited size of the data set precluded the performance of statistical techniques which could identify the direction and significance of any apparent co-variance. However, the humanistic approach adopted puts more emphasis on relationships which are verified through the use of qualitative methods than positivist-oriented statistical evidence. Thus the apparent relationships discovered in this extensive stage of the research were tested using intensive interviewing techniques. The results of the analysis of the extensive survey are detailed in Chapter 5. The next section describes the way in which the intensive surveys were designed, analyzed and interpreted.

4.4 The intensive surveys

The intensive phase of the research includes two distinct stages: the survey of rural businesses and the survey of external agencies. This section describes how the intensive research methodology was developed in the light of the findings from the extensive phase and details the practical design and implementation of the surveys.

The rationale for conducting intensive (or qualitative) research relates to both the type of information sought and the conceptual framework upon which the research methodology is based. Much of the information required about the adoption of ICTs in rural businesses and the possible implications that this will have for rural development is in the form of attitudes, opinions and anecdotal evidence of how decisions are made within organizations. These types of information can only be satisfactorily acquired through one-to-one discussions with the individuals concerned. This necessitates the use of semi-structured personal interviews with decision-makers in rural businesses and key actors in rural agencies. The interview method both affords the interviewee sufficient scope to discuss and put forward their own opinions on issues raised, while still providing ample guidance for the interviewer by means of a minimal level of structure. As discussed previously (in section 4.2.2) this method of obtaining information is commonly employed in research which follows a humanistic behavioural approach.

4.4.1 Rural businesses

The main aims of the intensive business survey were two-fold: firstly, to obtain a more in-depth insight into the internal decision-making environment within rural firms; and secondly, to gain a fuller understanding of the decision-making processes which operate, particularly with respect to the adoption and use of ICTs. These general aims may be expressed more precisely as six objectives, determined on the basis of the theoretical framework outlined in Chapter 3 and in the light of findings which emerged from the analysis of the extensive survey. The business survey was designed to:

1. find out more about the business itself and its external linkages with other firms and organizations;
2. find out more about the use which is made of ICTs within the business;
3. investigate future plans of the decision-maker(s) regarding both the business in general and the use of ICTs in relation to the business;
4. examine in depth decision-making processes within the business, particularly those related to the adoption of new technologies;
5. explore in detail the personal characteristics of the decision-maker(s); and
6. examine the attitudes of the interviewee(s) towards the use of ICTs and their opinions

on the possible impacts of this use, both within their own business and in other rural firms, the local rural area and, more generally, in other rural areas.

These objectives informed the design of the interview schedule which was divided into two main sections. The first was intended to derive more in-depth, factually-oriented information on *the firm*, its use of ICTs and its external linkages with other businesses and organizations and to elicit attitudes about this information. The second was designed to probe information about *the decision maker and decision-making processes*, both current and in the future. Much of this information was extremely subjective in nature. The interview schedule ensured that the major objectives outlined above were met for each interview and was an invaluable tool in maintaining a high level of consistency, and thus comparability, between interviews. A copy of the interview schedule used in the rural business survey is provided in Appendix 4.3.

Potential interviewees for the intensive survey of rural firms were *purposively* selected from among the respondents to the postal questionnaire survey. Selection was carried out in such a way as to obtain views from decision makers in as wide a range of firms as possible. Interviewees were therefore selected from many different types of firms in terms of the products they make, the size of firm and the length of time in operation.

Selection was performed with three main goals in mind:

1. to represent as many different types of firm as possible (in terms of general characteristics);
2. to represent both 'adopters' and 'non-adopters' of ICTs; and
3. to obtain the opinions of respondents who were particularly interested in using ICTs in their businesses in the future.

It should be noted that the third goal was not to exclude those respondents who did not indicate a particular interest in adopting ICTs, but to ensure that the research achieved its aim of determining reasons *for* ICT adoption first and foremost. The reasons why certain firms have so far failed to adopt ICTs (i.e. the reasons *against* ICT adoption) were explored in interviews with non-adopters.

The criteria upon which individual businesses were selected for interviewing include:

- product type
- firm size (by number of employees)
- age of firm
- length of time in operation in the study area
- status (as an independent firm or a branch plant)
- customer and supplier linkages (their number and geographical extent)
- workforce dynamics (recent or planned expansion or contraction)
- current use of ICT equipment and services (i.e. 'adopter' or 'non-adopter')
- potential plans to use ICT services in the future
- sources of advice and information used regarding ICT adoption.

These criteria were ranked in terms of their importance in the selection process on the basis of those factors which, from the results of the extensive analysis, appeared to vary most significantly. The ranking of criteria was also dependent on the factors deemed important in the conceptual framework. Comments made by respondents at the end of the postal questionnaire were also taken into account. For example, some expressed a genuine interest in using ICTs in their businesses and in the concept of telecottages, even though they were not yet using such technology. This suggested that their opinions on the topic might be of considerable use in the research due to the emphasis on determining the future uptake of ICTs within the rural firm population. This aspect of the research provides an important input into the issue of implications for future rural development policy in relation to ICT use among rural businesses as it indicates the extent to which uptake might increase in the near future. In addition, since determining the potential future levels of ICT uptake is one of the three research aims, the views of those most likely to be potential instigators of this uptake are crucial. It is also possible that those respondents who made extra comments may be more willing to be interviewed.

On the basis of the number of responses received in the extensive research phase (i.e. 129) and the range of firm types which emerged (both in terms of their general characteristics and their levels of ICT adoption), an initial sample size of twenty firms was considered

adequate to represent the range of firms. This apparently small sample size reflects two aspects of the research. Firstly, the theoretical underpinnings of the methodology are of a humanistic behavioural nature rather than of positivistic origin, implying that the quality and depth of interviews, rather than the quantity, are of paramount importance. Secondly, the depth of information required meant that the interviewing process would itself be time-consuming, as would the analysis of the large amounts of data likely to be obtained. Thus, in order to be effective in analysing this material within the existing time constraints, a smaller sample size was preferred. At this stage, however, rather than putting an absolute finite limit on the amount of fieldwork to be performed, it was proposed that if, on completion of these interviews, there appeared to be more new information still emerging, more interviews would be undertaken. This strategy is commonly implemented in purposively sampled surveys where interviewing is carried out until a state of information saturation is reached or until the return, in terms of new information emerging, on each interview is significantly reduced (Maykut & Morehouse, 1994). Supplementary interviews were not necessary as the twenty interviews originally planned appeared to have exhausted the range of information which might be obtained.

The duration of interviews was commonly between one and a half and two hours. A dictaphone was used to record the interviews in order to save time (which is particularly important when interviewing the managing directors and chief executives of businesses who have very little time to spare for non-business-related matters) and to preserve the accuracy of the dialogue for analysis and interpretation later. This also meant that note-taking, which can be intrusive, was not necessary during the interviews and hence the conversation was allowed to flow 'naturally'. Bearing in mind the strong influence of the social context of the situation on the data obtained in behavioural research, this was a significant aid to the derivation of more complete information. Notes were taken directly after the interviews in order to provide a textual record of any unspoken information which emerged, such as environmental factors, body language, emotions and details of any points at which the interview was interrupted. Full transcriptions of the interviews were made as soon as possible afterwards; these included all verbal and non-verbal communication. It was important to make full transcriptions since the research was concerned not only with what might be expected to be found, but also with what had not already been proposed in

the theoretical thinking upon which the empirical work is based. In other words, full transcription facilitated the *"bottom-up"* approach to the analysis of data.

The recording of interviews is both beneficial and problematic. It provides a full and permanent record of what went on and dispenses with the need to take notes during the interview, which is disruptive to the flow of the conversation. However, Dictaphones are occasionally intrusive, making some interviewees nervous and reluctant, and they are not always reliable, causing major problems of loss of information when they fail to record all of what was said or when the quality of the recording is poor. This is why it is essential to take notes on the interview as soon as possible afterwards. Finally, if full transcriptions are to be made of each interview, the process can be extremely time-consuming. Transcripts of two hour interviews regularly spanned 25 to 30 pages and 15,000 words. Maykut and Morehouse (1994) suggest that full transcriptions (i.e. including all verbal and non-verbal information collected) may take up to twenty hours for interviews of this length.

Reduction and analysis of the considerable amounts of amorphous qualitative material contained in these transcripts involved a range of textual strategies in accordance with the *"top-down"* and *"bottom-up"* approaches introduced in section 4.2.2.

1. The *"top-down"* approach:

   Themes were identified (from researching the literature and from the conceptual framework) which were believed to be of particular relevance to the central topic - ICT penetration in rural businesses. These themes include, for example, 'telematics and decision-making'. Within this broad theme several aspects were considered whereby it was possible to identify different types of firm and different types of decision-maker. These aspects were: reasons for telematics adoption; types of adoption; decision-making modes; types of decision-maker; types of firm in relation to telematics requirements.

2. The *"bottom-up"* approach:

   Firstly, themes were identified which emerged from the analysis of the extensive data as being important in differentiating patterns of ICT adoption among rural firms (refer

to Chapter 5 for more details). These themes included, for example, the importance of relationships between ICT adoption and the nature of the links firms have with their suppliers and customers. Secondly, by listening to what informants have said, how they have answered the questions and interpreted the issues raised, it was possible to glean from their dialogue further themes which emerge as key issues from their point of view. These were often issues which did not previously arise in the literature and might therefore be considered to be 'true findings'.

The practical 'sorting' of text according to these approaches was carried out in a manner which incorporates methods suggested by both Tesch (1990) and Lincoln & Guba (1985). Firstly, Tesch suggests that in trying to impose some structure on textual qualitative data, eight steps should be considered:

1. Get a sense of the whole. Read through all of the transcriptions carefully. Perhaps jot down some ideas as they come to mind.
2. Pick one document (one interview) - the most interesting, the shortest, the one on top of the pile. Go through it, asking yourself, What is this about? Do not think about the 'substance' of the information, but rather its underlying meaning. Write thoughts in the margin.
3. When you have completed this task for several informants, make a list of all topics. Cluster together similar topics. Form these topics into columns that might be arrayed as major topics, unique topics and leftovers.
4. Now take this list and go back to your data. Abbreviate the topics as codes and write the codes next to the appropriate segments of the text. Try out this preliminary organizing scheme to see whether new categories and codes emerge.
5. Find the most descriptive wording for your topics and turn them into categories. Look for reducing your total list of categories by grouping topics that relate to each other. Perhaps draw lines between your categories to show interrelationships.
6. Make a final decision on the abbreviation for each category and alphabetize these codes.
7. Assemble the data material belonging to each category in one place and perform a preliminary analysis.
8. If necessary, recode your existing data.

(Tesch, 1990, pp.142-145. In Creswell, 1994, p.155.)

Maykut & Morehouse's suggestion of identifying units of meaning within the data, or "unitizing" the data (Lincoln & Guba, 1985), has been incorporated into this method. Maykut & Morehouse stress that in deciding upon what does and does not constitute a unit of meaning in the text, it should be remembered that "each unit of meaning identified in the data must stand by itself, i.e. it must be understandable without additional information" (Maykut & Morehouse, 1994, p.128). In practice, they suggest that each separate unit of meaning is then cut out of the transcript and taped to an index card, which is labeled appropriately to indicate from which interview it is taken and from where within that interview. Units of meaning may then be categorized by placing cards in groups of similar units of meaning. This method is also useful for comparing similar units of meaning from different interviews in order to identify patterns among them.

Some modifications have been made in order to tailor this method of systematic sorting of qualitative data to this particular research. The following procedure was carried out for all 20 interview transcripts:

1. Interviews were transcribed and line numbers imposed on each separate transcript which ran continuously down the left hand margin throughout the entire document.

2. Interviews were read through, making notes on the various themes which emerged. Many of these themes obviously tallied with the questions which were asked and hence the list strongly resembled the interview schedule at first.

3. For each interview, the transcript was then categorized and manually separated according to the themes identified within it and each theme was glued to an index card. Some themes spanned up to nine index cards.

4. Index cards were labeled by theme (in the top left hand corner) and with a code (in the top right hand corner). An example of the way in which the cards were coded is as follows: T9/CUSU 1/3 denotes Transcript of interview number 9, theme - Customers and Suppliers, card number 1 of 3 relating to this theme.

5. In order to accommodate the fact that not all the text on each index card related directly to the main theme of the card, and to avoid chopping themes up too much and thus losing the context of the text (i.e. splitting units of meaning (Maykut & Morehouse, 1994, p.128)), text on the card which directly related to the theme of the card was highlighted using a highlighter pen. On the reverse of the card other themes which were found within the text (termed 'embedded themes') were noted, along with the line numbers indicating their position within the text, in order that they could be easily located during later analysis.

6. When all of the interviews had been entirely reduced to index cards, the list of themes contained within the interviews was revisited and the themes grouped together into broad categories. For example, the themes *'Customer location'*, *'Numbers of customers'* and *'Types of customers'* were amalgamated into one broad category described as *'Customer linkages'*.

7. The resulting broad categories were then grouped under one or other of the approaches described above - i.e. *"top-down"* or *"bottom-up"*. For example, the category *'Entrepreneurial characteristics'* might be grouped under *"top-down"* since it was one of the main factors identified in the conceptual framework as being of influence in the process of ICT adoption, while the category *'Customer linkages'* would be classified as *"bottom-up"*, since it was one of the major themes which emerged from the analysis of the quantitative data as being potentially influential in patterns of ICT uptake among rural firms. Furthermore, the categories *'Product quality versus prime location'* and *'Commuting to and living in large cities'* would also be classified under the *"bottom-up"* approach since they include themes introduced by the informants themselves which were not previously foreseen by the researcher. The categorization of themes or 'units of meaning' is detailed in Appendix 4.4.

Once the information had been systematically sorted in this way, it was possible to reconstruct it for the purposes of analysis and interpretation by re-sorting the completed index cards. In a similar manner to the original process of sorting the data, re-sorting was also performed in two directions - *"top-down"* and *"bottom-up"*. Firstly, the *top-down*

analysis involved re-sorting the data according to those themes which would reveal information most likely to satisfy the requirements of the three research aims set out in Chapter 1. This involved first going back to the conceptual framework to identify particular factors deemed likely to provide clues in satisfying the research aims. These were then examined both in conjunction with other factors thought to be related and in the broader context of the interview and the firm in question. The themes identified in this *top-down* analysis as of most relevance to each research aim were applied to specific research questions in order to extract meaningful information from them, thus satisfying the aims. Secondly, the *bottom-up* analysis was performed simultaneously. Factors and themes which had not been previously predicted as having an influence on the decision-making processes within rural businesses were identified during the sorting of the data and informed the analysis as it was on-going.

In practical terms this process of sorting, analysis and interpretation involved first selecting the index cards containing the themes extracted from each individual interview and arranging them on a large flat surface so that all could be viewed together. This allowed links and relationships to be found both between themes and between interviews. This is a cumbersome process, but it affords a perspective on the data which is both more visual and holistic and allows the grouping and re-grouping of themes (i.e. index cards) as more patterns in the data become apparent. Relationships and causal links between themes were noted and in this way two types of textual representation of the data were created: the first a summary of each firm, and the second a summary of pathways and causal links between related themes and factors in the data indicated by patterns of comparison between firms. This re-organization of material not only helped identify patterns in the data, it also created a format which could be more easily presented as cameos and examples in the results chapters. Interpretation of the re-organized data involved both the reconstruction of decision-making pathways and the development of a typology of firms in relation to their ICT adoption behaviour. These are presented in Chapter 6 - "Factors influencing the uptake and use of Information and Communications Technologies in rural businesses (the analysis of the intensive survey)".

4.4.2 Agencies

The conceptual framework devised in the previous chapter suggested that, apart from factors within the firm itself, there are also external factors which act upon the firm's decision-maker(s). These external factors influence the range of options which are available to decision-makers and, thus, the decisions which are made. They are therefore important in shaping the patterns of ICT uptake within rural firms. These external factors include agencies acting at local, regional and national levels. In order to fully understand the reasons for the patterns of ICT penetration among SMEs in the rural study area, it is therefore necessary to research the role of these 'external factors'. This requires a survey of agencies, the execution of which is the focus of this section.

The aim of the survey of agencies was to gain a deeper understanding, from the agency perspective, of their role in the uptake of ICTs in rural firms. Agencies to be surveyed were identified in four main ways. Firstly, local knowledge, both of the researcher and of the interviewees from the survey of rural businesses, was important in identifying relevant agencies. Interviewees in the business survey were questioned directly about the sources of information they used in relation to ICTs, including whether or not they had approached any agencies. Secondly, the economic development officers (or equivalent individuals) working in local authorities throughout the study area were contacted and asked about their role in promoting the use of new technologies in rural businesses. They were also asked about the existence of other 'agencies' providing business assistance in the area, including both quasi-governmental organizations and independent bodies. Thirdly, the Chambers of Commerce operating in the study area were contacted to determine both their role in advising and assisting local businesses and to find out about other agencies fulfilling this role. Finally, the national institutions, such as the Rural Development Commission, the Department of Trade and Industry, the Countryside Commission and ACRE were approached for information on local contacts in the study area.

In order to meet the main aim of the agency survey (outlined above) the research was designed to fulfill a number of objectives:

1. to identify the precise role (or mission) of the agency within the local rural business community;

2. to examine the nature of the agency's policies (both formal and informal) towards rural firms and the use of ICTs;
3. to explore the ways in which agencies contact and communicate with rural firms and with each other;
4. to discover the type(s) of information and advice which agencies supply to rural firms;
5. to determine the attitudes of interviewees representing agencies towards the use of ICTs within rural businesses; and
6. to discover (from the agency perspective) the perceived impacts of the business use of ICTs.

As in the case of the business survey, in-depth interviews were used to derive this information from individuals working within relevant agencies. These interviews were also guided by an interview schedule, a copy of which may be found in Appendix 4.5. The schedule was composed of five distinct sections to obtain information on: the agency or organization itself; its policies (on rural economic development, rural businesses and ICTs in rural businesses); the perceptions of the agency with regard to the current economic conditions and levels of ICT uptake and use; future policy initiatives, particularly in relation to ICT use in local businesses; and any further information or comments raised by the interviewee. Interviews were shorter, on average, than those in the rural business sector, generally lasting between 45 minutes and one and a half hours. They were not taped, but were recorded through note-taking both during and directly after the interview. Notes were then entered into a template of the interview schedule (in Microsoft Word) as soon as possible following the fieldwork.

It was not considered necessary to tape record the agency interviews for two reasons. Firstly, this stage of the research was concerned with structural constraints on ICT adoption, as opposed to adoption behaviour itself. The information required was thus less subjective than that sought in interviews with business people. Whereas interviews with rural entrepreneurs aimed to explore their attitudes, motives, opinions and goals (about which much can be discovered through exploratory open-ended discussion in addition to direct questioning), interviews with agency representatives aimed to examine, more objectively, the agency as a body and its approach to the issue of ICT uptake and use in

business. Although perceptions of current ICT uptake were explored from the 'perspective' of external agencies, such information was more concise than the extended discussion of the business interviews and thus required no more than detailed note-taking. Secondly, full transcription of taped interviews is a lengthy process and is only justifiable when a 'bottom-up' approach constitutes a significant element of the research. In the case of the agency survey, the 'bottom-up' approach represented a minimal aspect; this was controlled by the use of a more structured interview schedule.

Information was also obtained through a range of written sources produced by local authorities and agencies in the area and institutions working in rural areas, both regionally and nationally. These included development plans, strategy documents, annual reports, promotional literature, local labour market summary documents, fact files and reports on commissioned surveys of the local economy.

The analysis and interpretation of the agency survey data resembled, in some ways, the procedures followed in the survey of rural businesses. However, the less subjective nature of many of the questions and the more structured nature of the interview schedule meant that less sorting, re-sorting and categorization of the data was necessary. In addition, the amount of data obtained was significantly smaller, thus requiring less compaction. The agency survey also relied on documentary sources of data which introduced a further dimension to the methods of analysis and interpretation employed.

The completed transcripts (i.e. the interview schedule templates described above) were read through in their entirety. This allowed both an overview of the range of information collected and the first opportunity to begin identifying the main themes of discussion. Themes were derived primarily from the structure of the interview schedule, as this was more rigidly adhered to during the agency interviews than had been the case in interviews in rural businesses. Additional themes, however, did arise, both from the interviewing process and from reviewing the documentary sources of information.

The material was then re-organized theme by theme. Extracts from all the interviews were categorized by theme, which meant that each theme could be compared across the range of

agencies. Relevant documentary evidence was also added to the categorization allowing comparison to extend to those agencies in which it was not possible to conduct interviews. The themes fall into two broad categories:

1. the *perceptions* of agencies regarding local economic conditions and ICT use by rural businesses; and
2. the *approaches* of agencies towards the issue of ICT adoption and use by rural businesses, including any specifically directed policies or strategies.

From the analysis and interpretation of the data, it was possible to gain an understanding of the way in which agencies believed the process of ICT adoption to be developing within the study area and to gain a perspective on how they are reacting to this process. The perspectives of both the agency interviewees and the business interviewees were cross-referenced to identify areas of incompatibility, i.e. where the views of businesses and agencies were not in agreement, for instance with regards to levels or types of assistance provided by agencies. Agency perceptions were also compared with the results of this research and differences noted. For example, discrepancies between the agency view of current levels and types of ICT use by businesses and the findings of the business survey regarding these parameters may have implications for the research methodology employed or for the direction of agency policy. The findings of the agency survey are presented in Chapter 7.

4.5 Chapter summary

This chapter has outlined the methodological approach adopted in order to investigate the three central research themes:

1. patterns of ICT uptake and use in rural businesses;
2. factors (both internal and external to the firm itself) which, on the basis of existing literature and the proposed theoretical framework, are thought to influence the uptake and use of ICTs in rural businesses; and, hence, the potential for further uptake of ICTs in the selected businesses; and
3. the implications of these patterns of ICT uptake and use for rural development.

The progression from theory to method was outlined, demonstrating how the use of a combined methodology (incorporating both quantitative and qualitative methods) may be employed in order to satisfy the needs of both the positivist and humanist elements of the behavioural theoretical background established in Chapter 3. The rationale for combining research methods was also explained, highlighting the advantages and limitations of their use, both in isolation and in combination. The practical application of extensive and intensive research methods was reviewed with a detailed account of each stage of empirical work from data collection and description to analysis and interpretation. A description of the general characteristics of the study area and its appropriateness for this research was also undertaken.

The methodology incorporated an extensive postal questionnaire survey of rural businesses in South Warwickshire, North West Oxfordshire and North East Gloucestershire to establish patterns of ICT uptake. An intensive survey comprising in-depth interviews with selected respondents from the extensive survey was used to explore further the intricacies of these patterns of uptake and the factors influencing them. This stage of the research probed particularly those factors internal to the firm, most importantly, the decision-making process. An in-depth interview survey of agencies was employed to investigate external factors acting on the decision-making processes within the firm. The findings of each of these stages of research are respectively the focus of the following three chapters.

Chapter 5

UPTAKE AND USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGIES AND SERVICES AMONG RURAL BUSINESSES

5.1 Introduction

The purpose of this chapter is to explore the nature of the population of rural manufacturing firms in South Warwickshire and the Cotswolds. It examines the structure of the manufacturing and engineering sector and investigates the ways in which businesses use Information and Communications Technologies (ICTs). This entails the examination of key relationships and patterns regarding both general characteristics of the businesses in the study area and specific features pertaining to the levels of technological penetration. The term *'technology penetration'* is used in this and subsequent chapters to indicate the degree to which rural businesses have adopted ICTs.

The chapter is based on the results of the extensive postal surveys of rural manufacturing and engineering firms. These results are mainly descriptive and, although inferences may be made about the reasons why particular relationships and patterns occur, the causal processes cannot be determined through this method of analysis alone. Hence, the relationships and patterns presented in this chapter form a descriptive basis upon which may be grounded more in-depth analysis of processes, in the form of intensive interviews with selected respondents.

Questions probed the key characteristics of businesses, including size, ownership, industrial sector, customer and supplier networks, and current and predicted future adoption of ICT technologies in manufacturing firms. The postal survey yielded a response rate of 42%. The questionnaires and coding systems used in this research may be found in Appendix 4. In order to determine the representativeness of respondent firms of the business population in the study area as a whole, contingency checks were carried out. These involved a comparison of the known characteristics of both respondent and non-respondent firms, including geographical location (by post code), firm size (by annual turnover) and principal product or service (by Standard Industrial Classification). These checks revealed few differences between the two populations, thus suggesting that the

respondent population provided an unbiased picture of firm characteristics across the study area as a whole.

For the purposes of this analysis, technology penetration in the surveyed firms is defined by their ownership of ICT equipment and use of advanced telematics services. The uses which firms make of their computers are also examined to assess the degree of penetration. In addition, the degree to which the whole concept of advanced telematics services has invaded the consciousness of the respondents (mainly entrepreneurs and managing directors) in rural firms is explored through their awareness of telematics services and the extent to which they perceive the need for these services in the future. Together these measures provide an indication of the overall penetration of opportunities and technological innovations in computing and communications within the rural economy.

The term *'industrial sector'* is used frequently throughout this chapter. The use of both this term and the term *'industrial sub-sector'* must be clarified, since they are widely used in the analysis and are important in differentiating the sample. 'Industrial sector' denotes the breakdown by Standard Industrial Classification (SIC) into sectors (Central Statistical Office, 1993). In this case the 'engineering' sector and the 'other manufacturing' (together referred to hereafter simply as 'manufacturing') sector are involved. These two sectors are further broken down into sub-sectors of similar groups of products. Eleven sub-sectors were identified within the manufacturing sector. These are detailed in Table 5.3.

The analysis identifies the key features of the manufacturing sector and the business ownership and use of ICTs. In the manufacturing sector most firms are small and are owned by individuals or families. The vast majority are single site concerns and only a few have been set up in the last five years, most having been in operation for ten to twenty years. Around one third of the firms may be classified as 'engineering' firms, while the remaining two thirds are 'manufacturing' firms. The largest industrial sub-sector is 'wood and wood products'. Almost half of the firms surveyed rely on foreign customers in addition to customers in the local area and/or throughout the UK; only one fifth sell solely to local customers. Around half of the firms deal only with customers who are other

businesses and organizations. In addition, nearly two thirds are supplied by firms situated throughout the United Kingdom.

The level of penetration of ICTs is generally low amongst the rural businesses. Most have and use basic telephony equipment and services, but few use telematics. Among manufacturing firms, characteristics of ownership and use vary according to the number and geographical distribution of customers and suppliers. Firms which supply distant markets depend more heavily upon ICTs than firms which source from and supply the local area. The relationship between penetration/use and sourcing/supply transcends a series of less significant relationships with size, ownership and product characteristics. It highlights a key distinction in the rural economy between inward-looking firms, who make little use of ICT, and externally-oriented firms which are telematics-intensive. The characteristics of the manufacturing sector are the subject of the following section.

5.2 Characteristics of the manufacturing sector

Many characteristics of firms, including size, type of product made, customer linkages and supplier networks, may influence the adoption and use of ICTs. The size of a firm, for instance, should influence the level of resources available, both in terms of employees and finance. A larger firm is more likely than a smaller firm to have the financial capability to invest in such new technologies and to be able to employ specific staff to use them. The type of product made by a firm is also likely to have a large influence on whether or not there is a need for hi-tech means of communication. There is likely to be a higher base level of technology use, accompanied by a greater need for ICTs, in a firm producing precision engineering instruments, for example, than in a firm making wood products on a traditional craft basis. The type of product made will, in turn, generally have a bearing on the nature of the customer and supplier linkages of a firm. The more geographically dispersed and numerous these are, the more likely it is that a firm will need to use ICTs.

In order to begin to explore these assertions, relationships between variables are examined using simple cross tabulations. Data from the survey were input into a computerized database in the form of variables derived from the coded postal questionnaire responses. This section discusses the relationships discovered, but it is important to note that this

phase of the research can only partly describe the patterns emerging and make inferences as to why they occur. The nature of causality between these associated variables can only be examined through in-depth qualitative research methods, the results of which are presented in Chapters 6 and 7.

Size of firm

The manufacturing sector is composed mainly of very small firms. Over two thirds employ fewer than ten people on a full-time basis; more than 90% employ no more than fifty people full-time . More than two thirds are micro-enterprises employing no more than ten people (Table 5.1). The largest single category consists of firms which employ between two and five full-time workers, this group making up almost 40% of the population. There are very few firms at the larger end of the spectrum, only 6.1% employing more than 100 people. Part-time employment is important in the area. Around half of the firms surveyed employ part-time staff. These workers are especially common in the smaller firms. Some 3% of firms consist of part-time employees only. This may partly be a consequence of the restructuring of agriculture which has occurred in recent years and the increase in part-time farming and the shift to off-farm sources of income for members of farm families which has accompanied this process (Munton *et al.*, 1989).

Table 5.1 NUMBER OF FULL-TIME EMPLOYEES

Number of full-time employees	Firms employing full-time workers	
	% of 130	Cumulative %
0*	3.1	3.1
1	13.8	16.9
2 - 5	39.2	56.2
6 - 10	11.5	67.7
11 - 20	13.8	81.5
21 - 50	9.2	90.8
51 - 100	1.5	92.3
101 - 400	4.6	96.2
> 400	1.5	98.5
no answer	1.5	100.0
Total	100.0	

*** 0 indicates no full-time employees, i.e. part-time employees only.**

Despite their predominantly very small size, employment levels in most firms are stable. The change in the size of the workforce, both in the recent past and predicted in the near future, was explored. Some 15% of firms reported a contraction in the labour force over the last year, while 27% had experienced an increase. Around one third of firms expected to see their employment levels rise over the next twelve months. This is in accordance with economic profiles compiled by local authorities and partnership bodies working in the study area which emphasize the area's prosperity and its favourable future prospects (CDC, 1996; CWP, 1995; GCCI, 1996; HOETEC, 1996).

Ownership

The majority of firms (over 60%) are under the ownership of an individual or family, with most of the remainder under the ownership of people who are not related such as partners or shareholders (see Table 5.2).

Table 5.2 OWNERSHIP

Type of Ownership	%
individual or family	62.3
partners or shareholders	34.6
other	2.3
no answer	0.8
Total	**100.0**

Considering the relationship between ownership type and size of firm, the key trend emerging is that, on the whole, individual and family owned firms tend to be smaller in terms of the full-time workforce that they employ. Only about 23% of those firms owned by individuals or families have eleven or more full-time employees compared with 40% of those firms owned by people who are not related (i.e. partners or shareholders). This finding supports the assertion that individual/family owned firms have fewer available resources - in this case, in terms of workforce. Individual/family owned firms are more likely to be self-sufficient within the family and hence have fewer employees, relying solely on family members instead. In summary, partner/shareholder owned firms are, on the whole, larger in terms of the workforce they employ.

Product type

A wide range of products is manufactured in the study area. Despite the diversity, two distinct groups of firms may be identified. The population of firms is sub-divided into groups according to the products made and their SIC (Standard Industrial Classification) group. (Note: Sub-division was carried out according to published SIC groupings in such a way as to create groups of firms producing similar goods. The method by which this sub-division was accomplished and the origin of the groupings recorded in Table 5.3 is detailed in Appendix 5.1.) The largest sub-group of manufacturing firms is 'engineering' which accounts for 36.9% of the population. The remaining 63.1% of firms may be

termed 'other manufacturing'. These two groups ('engineering' and 'other manufacturing') are further sub-divided into groups of firms making similar products. The largest sub-sectors (in other words, the products most commonly manufactured by firms in the study area) include 'wood & wood products', 'metal goods & heavy machinery' and 'paper, printing & publishing'. The least commonly manufactured goods include 'precision instruments' and 'rubber & plastics'. The sectoral breakdown is shown in Table 5.3.

Table 5.3 INDUSTRIAL SECTOR

Industrial Sector	Industrial Sub-sector	Type of Product	% of 130
Engineering (SIC class 3)	1	engineering products not elsewhere specified	0.8
	2	metal goods & heavy machinery & equipment	20.0
	3	electrical & electronic goods & equipment	9.2
	4	motor & other vehicles (engines, bodies & parts)	5.4
	5	measuring checking & precision instruments & equipment	1.5
Sub - total			**36.9**
Other manufacturing (SIC class 4)	11	manufactured goods not elsewhere specified	14.6
	12	food & drink	3.8
	13	fibres, fabrics, textiles & leather (inc. household & clothing)	3.8
	14	wood & wood products	24.6
	15	paper, printing and publishing	13.8
	16	rubber & plastics	2.3
Sub - total			**63.1**

Customer and supplier linkages

Businesses in the study area support and are sustained by large and extensive networks of customers and suppliers. Despite the rural character of the area and the distance from principal urban centres, many firms look well beyond the local area for their suppliers and sales. International links are numerous and strong with many respondents indicating customer linkages throughout Europe and the US. Conversely, there is a group of companies which is essentially parochial in that suppliers and markets are predominantly in the local area. The distribution is largely, but not wholly, independent of size,

ownership and product characteristics. It relates closely to technology penetration and use. The linkage characteristics of each firm are defined by the number, type (whether other businesses or organizations, the general public or both) and location (whether local, throughout the UK, or abroad) of customers and suppliers. The profile of customers is complex and cannot easily be surveyed in a postal questionnaire, but some broad and highly significant generalizations are possible (Table 5.4).

Table 5.4 CUSTOMER PROFILES

	Firms (as a % of 130)
(i) NUMBER OF CUSTOMERS:	
1	1.5
2 - 5	13.1
6 - 10	16.9
> 10	50.8
no answer	5.4
not applicable	12.3
	100.0
(ii) CUSTOMER LOCATION:	
only local	21.5
elsewhere in the UK	22.3
local & elsewhere in the UK	12.3
elsewhere in the UK & abroad	36.9
local, elsewhere in the UK & abroad	6.2
no answer	0.8
	100.0
(iii) CUSTOMER TYPE:	
businesses &/or organizations	46.9
general public	19.2
both types	33.1
no answer	0.8
	100.0

Despite their small size, some 51% of firms have more than ten principal customers and a further 17% report between six and ten (Table 5.4 Part (i)). Products are supplied to customers within the local area, elsewhere in the UK and abroad. An important feature of firms in the area is the extent to which they supply distant markets. The customers of some 37% of firms are located outside the local area, both elsewhere in the UK and abroad. Foreign customers include companies located in Europe, Asia, Africa and the US. A further 41% of firms have customers elsewhere in the UK. Only 22% of firms serve the

local area exclusively (Table 5.4 Part (ii)). Such distinctions are, of course, highly sensitive to the arbitrary placing of the boundary of the area which is deemed to be local, but they do underline a surprising dependence upon distant markets. Most firms in the area have a significant and strong external orientation, supplying customers across the UK and overseas. Though located in a rural area, such firms are not dependent on local demand for their viability. A rural economy, in the sense of firms supplying local needs, does exist, but it is small, accounting for only one fifth of manufacturing firms.

The international extent of the market within which many of these firms operate is exemplified by the customer and supplier linkages of a Gloucestershire-based manufacturer of filtration paper which has been in operation since the early nineteenth century. This firm is family owned, employing 150 people on a full-time basis and a further ten part-time. The firm has sites in the US and in Italy. Both its suppliers and customers are based throughout the UK and abroad (including Germany and the US), hence reducing the degree to which the firm is dependent on the local area and increasing the importance within the firm of means of communication of information.

On the other hand, a small Warwickshire precision engineering firm, employing only three people full-time and one part-time, relies heavily on the local area for both its supplies and for its market, deriving all its supplies and all its custom from within a twenty mile radius. This firm is clearly much more integrated within the local rural economy and, indeed, is entirely dependent upon it for its existence. However, given the limitations of both its sourcing of raw materials and components and its market, issues of advanced communications technologies are likely to have comparatively little importance in this firm. This is supported by the findings of the extensive survey which show that the locally-oriented firm uses no more advanced forms of communications technologies than the phone and fax, while the firm with widespread customer and supplier linkages uses a broader range of ICTs, including computer networking through a LAN (Local Area Network) and Electronic Funds Transfer (EFT).

Having explored the nature of firms' customer linkages and how they relate to other firm characteristics, it is now appropriate to examine the geography of supply, since this is also

likely to relate to the levels of ICT penetration. As in the case of customer linkages, numbers and geographical dispersal of suppliers may affect firms' current use and future needs, in terms of communication of information. The supplier profile of each firm in the population was assessed according to the number of suppliers and their geographical location.

The geographical location of suppliers of raw materials and components to companies within the study area further underlines the high level of external orientation of firms surveyed. It reaffirms the existence of a set of externally-dependent companies operating alongside those which rely upon inputs derived from the local area. It is notable, firstly, that only 18% of firms depend solely on local suppliers, again indicating the limitations of local linkages in sustaining the rural business community. Supplier networks, however, are somewhat less extensive than customer networks, with only 17% of the population using foreign suppliers (Table 5.5 Part (ii)). In terms of the number of suppliers with which firms deal on a regular basis, more than half of the population have in excess of ten regular suppliers (Table 5.5 Part (i)).

Table 5.5 SUPPLIER PROFILES

	Firms (as a % of 130)
(I) NUMBER OF SUPPLIERS:	
1	0.8
2 - 5	17.7
6 - 10	23.8
> 10	55.4
no answer	1.5
not applicable	0.8
Total	**100.0**
(ii) SUPPLIER LOCATION:	
only local	17.7
throughout the UK	63.1
throughout the UK and abroad	16.9
no answer	1.5
not applicable	0.8
Total	**100.0**

Cross tabulation of customer variables and supplier variables exemplifies the more geographically extensive nature of customer linkages in comparison with supplier linkages. While 38% of firms have foreign customers, only 16% deal with suppliers from overseas. 12% of firms have no linkages beyond the local area and are therefore entirely sustained within the local economy (Table 5.6).

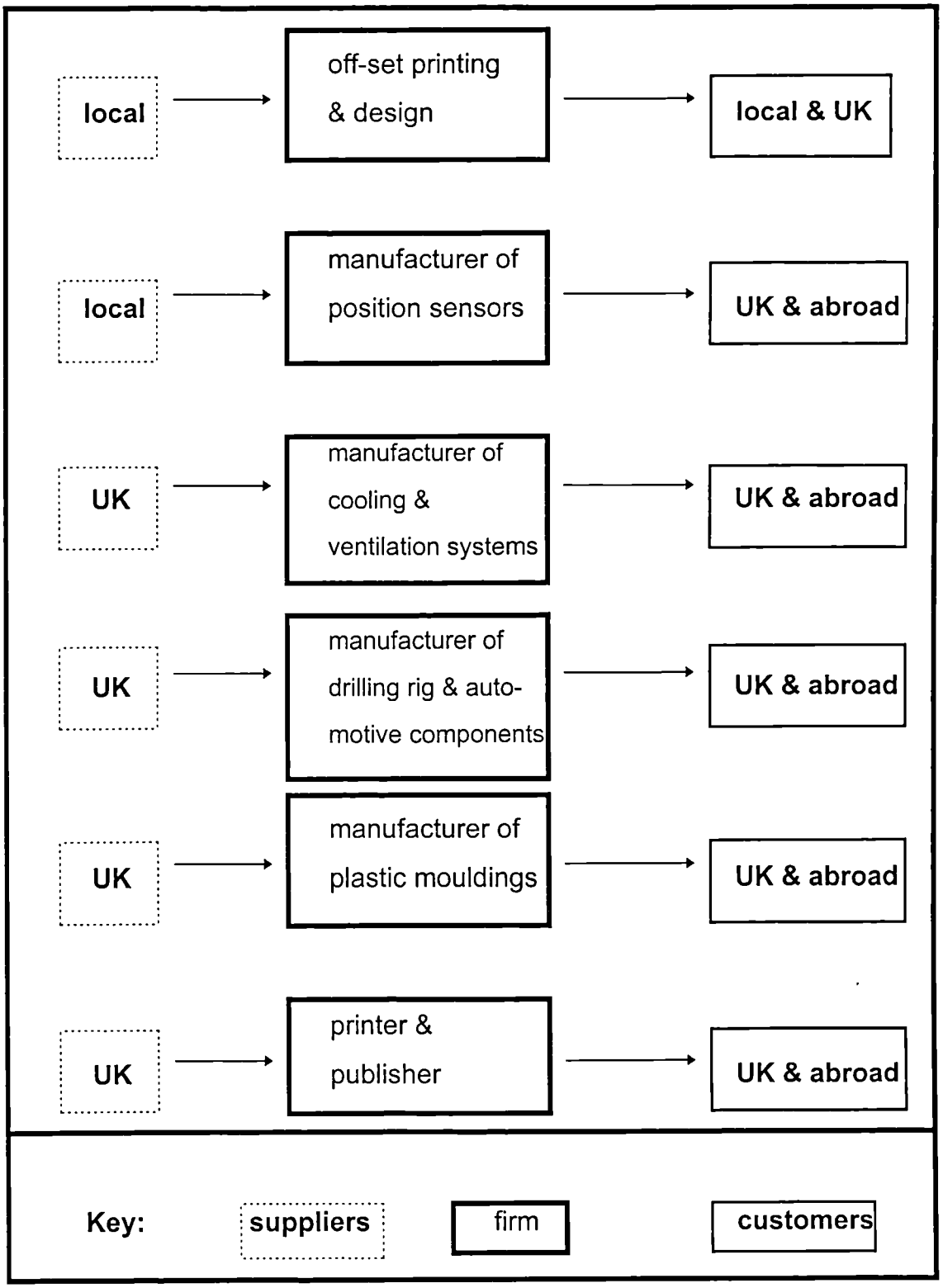
Table 5.6 GEOGRAPHICAL LOCATION OF CUSTOMERS AND SUPPLIERS

Customer location	Supplier location				
	only local	throughout the UK	thr'out UK & abroad	no answer	not applicable
only local	12.3	9.2			
elsewhere in the UK		18.5	3.8		
local & elsewhere in the UK	0.8	10.0	0.8	0.8	
elsewhere in the UK & abroad	4.6	22.3	10.0		
local, elsewhere in the UK & abroad		3.1	2.3		0.8
no answer				0.8	

[**Note:** Figures given are percentages of 130. Shaded cells highlight the two distinct types of firms; *'inwardly-oriented firms'* - those sustained solely by local suppliers and markets (i.e. situated within a twenty mile radius) - and *'outwardly-oriented firms'* - those whose suppliers and customers are located far beyond the boundaries of the local area.]

The extent to which the population of firms is dissected in terms of the geographical dispersal of customers and suppliers is illustrated in Figure 5.1. The examples of particular firms' customer and supplier networks highlight the fact that customers are generally more spatially dispersed than suppliers.

Figure 5.1 Supplier and customer linkages of selected firms surveyed



A Cotswold manufacturer of position sensors illustrates this disparity between suppliers and customers, in terms of the remoteness of their location. This very small firm is supplied by more than ten firms, all of which are located within the local area (i.e. within a twenty mile radius), yet it supplies an international network of customers (in Italy, Belgium, Switzerland, New Zealand and the US) from its rural Gloucestershire base.

Relation between external linkages and product type/industrial sector

There are several significant relationships between firms' customer and supplier linkages and the type of product made (defined here by industrial sector and sub-sector - refer to Table 5.3 or Appendix 5.1). In terms of the type of customers with which firms deal, however, there are very marked differences between the engineering and manufacturing sectors. 65% of engineering firms deal only with customers who are other businesses or organizations, while only 15% of firms in this sector sell solely to the general public (Table 5.7E Part (iii)). This is likely to be related to the nature of engineering products, which are often more specialized and hence more likely to be sold on to other customers, who are businesses which might be described as 'middle men', before being sold to the general public by specialist dealers. It is also a feature of many engineering products that they are specifically the inputs to other industries - e.g. motor vehicle parts - and are rarely sold direct to the general public. This point may be illustrated by the fact that the sub-sector 'motor and other vehicles (engines, bodies and parts)' exclusively sells to other businesses and organizations. Of firms selling only to the general public, 72% are from the manufacturing sector (Table 5.7M Part (vi)). The sub-sector contributing most to this figure is 'wood and wood products'. This is partly due to the fact that this is the largest sub-sector, but is also likely to be caused, in part, by the nature of the sector. Many of its firms are still run in the style of traditional country craft businesses and hence selling to the general public, and also tourists in this area, will account for the bulk of sales.

The following two firms illustrate the differentiation of firms' customers (in terms of type) by the nature of their product:

A Warwickshire-based family owned firm (in the manufacturing sub-sector, 'wood and wood products') makes bespoke English hardwood furniture. The product is sold only to

the general public. However, another family owned firm, also based in Warwickshire but this time in the engineering sector, is an O/E (Original Equipment) supplier of moulded and suspension components to the automotive industry. This firm sells exclusively to other businesses.

Firms in some sub-sectors have greater numbers of principal customers. For example, 80% of firms in the 'food and drink' sub-sector have more than ten principal customers. This figure falls to 68% for 'miscellaneous manufactured products' and 67% for both 'electrical and electronic goods and equipment' and 'paper, printing and publishing' (Table 5.7E Part(i) and Table 5.7M Part(iv)). However, there are few differences between the two main sectors (i.e. manufacturing and engineering) in terms of customer numbers.

Examining the location of principal customers, engineering firms have a slightly wider spatial range of customers with 50% of these firms, as opposed to 39% of manufacturing firms, having foreign customers. Slightly more engineering than manufacturing firms have customers based throughout the UK, while, at the other end of the scale, comparatively more manufacturing firms (24%, as opposed to 17% of engineering firms) have only local customers.

Turning to the variation of firms' supplier profiles and the products which they make, there is a substantial difference between manufacturing and engineering firms in terms of their respective numbers of suppliers; 65% of engineering firms have more than ten regular suppliers compared with only 50% of manufacturing firms. The geographical distribution of suppliers, however, varies little between sectors.

In summary:

- the majority of customers of engineering firms are other businesses and organizations rather than the general public
- engineering firms have a substantially wider geographical range of customers than manufacturing firms
- manufacturing firms deal with a more mixed customer base in terms of geographical location

- engineering firms have larger supplier networks, in terms of numbers, than manufacturing firms (Tables 5.7 and 5.8).

Table 5.7E Engineering firms: INDUSTRIAL SUB-SECTOR by CUSTOMER VARIABLES

Customer variables	Engineering					*A*	*B*
	1	2	3	4	5		
(i) Number of customers:							
1						*0*	*2*
2 - 5		26.9	33.3	14.3		*70.6*	*17*
6 - 10		7.7		42.9		*22.7*	*22*
> 10		57.7	66.7	42.9	50.0	*40.9*	*66*
no answer						*0*	*7*
not applicable	100.0	7.7			50.0	*25.0*	*16*
No. of firms in each sub-sector	1	26	12	7	2		*130*
(ii) Location of customers:							
only local	100.0	26.9				*28.6*	*28*
only UK		15.4	16.7	42.9		*31.0*	*29*
only abroad		26.9	66.7	42.9	50.0	*50.0*	*38*
local & UK		23.1		14.3		*43.8*	*16*
UK & abroad		3.8	8.3	14.3		*20.0*	*10*
local & abroad					50.0	*100.0*	*1*
all locations		3.8	8.3			*28.6*	*7*
no answer						*0*	*1*
No. of firms in each sub-sector	1	26	12	7	2		*130*
(iii) Type of customers:							
other businesses/organizations		53.8	75.0	100.0	50.0	*50.8*	*61*
general public	100.0	15.4	8.3		50.0	*28.0*	*25*
both		30.8	16.7			*23.3*	*43*
no answer						*0*	*1*
No. of firms in each sub-sector	1	26	12	7	2		*130*

[**Note:** Figures given are percentages of column totals. Figures in italics show engineering firms as a percentage of all firms surveyed for each customer category (*A*) and the total number of firms (all manufacturing) in each customer category (*B*).]

Table 5.7M Manufacturing firms: INDUSTRIAL SUB-SECTOR by CUSTOMER VARIABLES

Customer variables	Other manufacturing						*A*	*B*
	11	**12**	**13**	**14**	**15**	**16**		
(i) Number of customers:								
1				6.3			*100.0*	*2*
2 - 5	5.3		20.0	9.4			*29.4*	*17*
6 - 10	15.8	20.0	20.0	28.1	11.1	33.3	*77.3*	*22*
> 10	68.4	80.0	20.0	25.0	66.7	33.3	*59.1*	*66*
no answer	5.3		20.0	9.4	5.6	33.3	*100.0*	*7*
not applicable	5.3		20.0	21.9	16.7		*75.0*	*16*
No. of firms in each sub-sector	**19**	**5**	**5**	**32**	**18**	**3**		*130*
(ii) Location of customers:								
only local	5.3	20.0	40.0	34.4	27.8		*71.4*	*28*
only UK	31.6	20.0	20.0	28.1	16.7		*69.0*	*29*
only abroad	21.1	40.0	20.0	9.4	38.9	66.7	*50.0*	*38*
local & UK	10.5	20.0		15.6		33.3	*56.2*	*16*
UK & abroad	15.8			6.3	16.7		*80.0*	*10*
local & abroad							*0*	*1*
all locations	15.8		20.0	3.1			*71.4*	*7*
no answer				3.1			*100.0*	*1*
No. of firms in each sub-sector	**19**	**5**	**5**	**32**	**18**	**3**		*130*
(iii) Type of customers:								
other bus/orgzns	52.6	60.0	20.0	15.6	50.0	66.7	*49.2*	*61*
general public	10.5		40.0	34.4	16.7		*72.0*	*25*
both	36.8	40.0	40.0	46.9	33.3	33.3	*76.7*	*43*
no answer				3.1			*100.0*	*1*
No. of firms in each sub-sector	**19**	**5**	**5**	**32**	**18**	**3**		*130*

[**Note:** Figures given are percentages of column totals. Figures in italics show engineering firms as a percentage of all firms surveyed for each customer category (*A*) and the total number of firms (all manufacturing) in each customer category (*B*).]

Table 5.8E Engineering firms: INDUSTRIAL SUB-SECTOR by NUMBER OF SUPPLIERS

Supplier variables	Engineering					A	B
	1	2	3	4	5		
Number of suppliers:							
1						*0*	*1*
2 - 5		11.5	16.7			*21.7*	*23*
6 - 10		30.8		28.6		*32.3*	*31*
> 10	100.0	53.8	83.3	71.4	50.0	*43.1*	*72*
no answer		3.8				*50.0*	*2*
not applicable					50.0	*100.0*	*1*
No. of firms in each sub-sector	**1**	**26**	**12**	**7**	**2**	*48*	*130*

[**Note:** Figures given are percentages of column totals. Figures in italics show engineering firms as a percentage of all firms surveyed for each supplier category (*A*) and the total number of firms (all manufacturing) in each supplier category (*B*).]

Table 5.8M Manufacturing firms: INDUSTRIAL SUB-SECTOR by NUMBER OF SUPPLIERS

Supplier variables	Other manufacturing						A	B
	11	12	13	14	15	16		
Number of suppliers:								
1				3.1			*100.0*	*1*
2 - 5	31.6	20.0		15.6	33 3		*78.3*	*23*
6 - 10	21.1		20.0	21.9	38 9	66 7	*67.7*	*31*
> 10	47.4	80.0	80.0	56.3	27.8	33 3	*56.9*	*72*
no answer				3.1			*50.0*	*2*
not applicable							*0*	*1*
No. of firms in each sub-sector	**19**	**5**	**5**	**32**	**18**	**3**		*130*

[**Note:** Figures given are percentages of column totals. Figures in italics show engineering firms as a percentage of all firms surveyed for each supplier category (*A*) and the tota number of firms a manufacturing) in each supplier category (*B*).]

5.3 Technology penetration in the manufacturing sector

The penetration of ICTs in the rural manufacturing sector was examined in a variety of ways through the questionnaire survey. Questions probed the availability of ICT equipment in rural firms and the nature of computer use, where this was applicable. The current levels of use of advanced telematics services such as E-mail, Electronic Data Interchange (EDI) and Electronic Funds Transfer (EFT) were also examined. In addition,

respondents' awareness of these services and their opinions as to whether or not such services may be needed by the firms in the future were explored.

In general, the uptake/adoption of ICTs among the rural firms is low. In spite of this generally low level of technological penetration, variations between firms (in terms of their uptake of technology) are still evident. Cross tabulation of variables relating to general firm characteristics and technology penetration reveals a two-tiered rural economy. The first group comprises firms which are inwardly-oriented, in terms of both their sourcing of raw materials/components and their markets, and serve the general public in particular. These firms have relatively basic telecommunications and make some limited use of elementary information technology. The second group comprises firms which are outwardly-oriented in terms of their customer and supplier linkages, most frequently serving the business market rather than individual consumers. These firms use more advanced ICTs, including telematics.

This section will examine the variations of technology penetration within the manufacturing sector as a whole, identifying a number of key relationships. These are further developed in section 5.4 which discusses the implications of these trends, both in terms of further research into the nature of causality and in terms of their implications for rural agencies and policy makers.

Access to ICT equipment

Basic telephony is used by almost all firms, with 99% owning a telephone and 82% having the use of a fax machine. The use of IT (i.e. computers) is also widespread; 68% of firms have desk-top computers (see Table 5.9) and 36% of these also have lap-top computers. However, the possession and use of true telematics equipment by rural firms in the study area is very limited. This may be illustrated by the fact that only 27% of firms have the use of a modem, the most basic requirement of telematic communication. Furthermore, although modems are available, this does not necessarily mean that they are in use (something which is exemplified by figures on the use of telematics services, detailed later in this section), since many computers are now manufactured with an internal modem included. Hence, modems are no longer exclusively acquired through choice, intention or

need. With fewer than 10% of firms having an EFT facility, being connected to an Integrated Services Digital Network (ISDN) line or having the use of a video-conferencing facility, it is clear that, in terms of advanced telematics, the rural firms of the Cotswolds and South Warwickshire are, as yet, somewhat backward.

Table 5.9 ACCESS TO ICT EQUIPMENT

Equipment	% of firms at which available	No. of pieces of equipment	% of firms	cum. %
Telephone	99.2	1	6.2	6.2
Fax	82.3	2	10.0	16.2
Desk-top computer	68.5	3	15.4	31.5
Answerphone	56.2	4	12.3	43.8
Mobile phone	51.5	5	17.7	61.5
Modem	26.9	6	7.7	69.2
Lap-top computer	24.6	7	9.2	78.5
Scanner	12.3	8	6.9	85.4
CD-rom drive	11.5	9	5.4	90.8
EFT facility	9.2	10	3.1	93.8
LAN	9.2	11	4.6	98.5
Pager	8.5	13	1.5	100.0
ISDN	6.9	Total	100.0	-
Optical reader	5.4			
Video conferencing facility	2.3			
Videotex	0.8			

Mean number of pieces of equipment available = 5.3

Levels and types of computer use

Having examined the extent of availability of equipment in firms, it is also of interest to explore the type of use which is made of this equipment. Firstly, the results of the survey indicate that, in line with findings so far, the types of use which are made of computers are also relatively basic in terms of technological innovation. The most commonly used computing function is word processing - by 96% of firms owning a computer; 82% use their computer for financial management, while 78% use the computer for producing accounts. Considering the more advanced uses of computers, however, very few firms have yet begun to explore such avenues. For example, only 16% of those who have access

to a computer use it to communicate via E-mail. Furthermore, more than half of firms who have computers use no more than four computing functions, indicating a general underuse of potential computing ability amongst firms in the study area.

Table 5.10 COMPUTER FUNCTIONS

Computer function	as a % of firms who have computers	No. of functions used	as a % of firms who have computers	cum. %
Word processing	95.5	1	3.4	3.4
Book-keeping	82.0	2	11.2	14.6
Producing accounts	77.5	3	9.0	23.6
Generating information	67.4	4	32.6	56.2
Publishing documents	38.2	5	18.0	74.2
Manufacture of products	34.8	6	9.0	83.2
Design & development of products	33.7	7	10.1	93.3
E-mail	15.7	8	6.7	100.0
Other uses	13.5	Total	100.0	

Mean number of computer functions used throughout the popu at on = 3.1
Mean number of computer functions used by those who have computers = 4.5

Penetration of advanced telematics

When the penetration of advanced telematics services among the population of rural firms is examined, this theme of low levels of adoption and use is sustained (Table 5.11). While *levels of awareness* of telematics services, such as E-mail, EFT, EDI and teleworking, are generally between 30 and 40%, levels of *actual use* remain extremely low - generally around or below 10%. EFT is the most commonly used service, with 12% of firms currently using such a facility. E-mail is used by only 10% of firms, despite the fact that 38% are aware of it. When respondents were asked to predict which of the services they may need in the future, however, EDI emerged as that which is most commonly thought of as being of possible *future use* within firms; 16% of respondents indicated this opinion. 9% believed they may need E-mail in the future, while EFT and teleworking are predicted as being of possible future use by 7% of respondents.

Table 5.11 TELEMATICS SERVICES

Service	using %	aware of %	may need %	No. of services	using %	aware of %	may need %
EFT	11.6	37.7	6.9	0	78.5	38.5	76.9
EDI	7.7	27.7	16.2	1	12.3	4.6	6.2
E-mail	10.0	37.7	9.2	2	5.4	6.9	8.5
Teleconferencing	3.1	40.0	5.4	3	1.5	7.7	7.7
Teleworking	3.8	35.4	6.9	4	1.5	6.2	0.8
Teleshopping	0.8	43.8	0.8	5	0.8	7.7	0
Video conf'cing	1.5	34.6	3.8	6	0	5.4	0
Videotex	2.3	30.0	0	7	0	4.6	0
Other services	1.5	3.8	0	8	0	16.2	0
				9	0	2.3	0
				Total	100.0	100.0	100.0

Mean number of services currently using = 0.4
Mean number of services currently aware of = 3.2
Mean number of services may need in the future = 0.5

Relations between technology penetration and customer networks

Clearly, there are variations in the degree to which ICTs have penetrated rural firms in the Cotswolds and South Warwickshire. Cross tabulation of measures of technology penetration with variables pertaining to the general characteristics of firms (such as customer and supplier linkages and industrial sector) can provide some insights into the variation in adoption and use of technology among firms. These patterns are now explored and their implications discussed.

Several important relationships exist between the nature of firms' customer and supplier linkages and the extent to which ICTs have been adopted. Rates of adoption and use of advanced ICTs vary most significantly with the geographical location of customers, increasing with distance between firms and their markets. The propensity of firms to have more than the average number of pieces of equipment available to them on-site increases sharply as their customer base widens. For instance, only 7% of firms serving exclusively local customers have more than five pieces of equipment. This compares with 31% of those firms serving the UK market and a significantly higher 61% of firms whose market includes foreign customers (Table 5.12 Part(i)). This increase in technology penetration

with spatial dispersal of the market supports the theory put forward previously that firms with more distant markets have more need of advanced information and communications technologies.

The extent to which the number of pieces of equipment can indicate technology penetration is limited, however, because it does not take into account the type of equipment nor its relative technical advancement, considering widely varying types (such as the telephone and videoconferencing) at the same level of innovative merit. Therefore, it is also necessary to consider pieces of equipment separately. Looking firstly at more basic information technology and telecommunications - these are slightly more likely to be found in firms which are outward-looking in terms of their customer base. Firms who have foreign markets account for 43% of the population of firms surveyed; the fact that 50% of firms which have fax and 53% of firms which have computers are firms with foreign customers means that such outwardly-oriented firms are proportionately more likely than inwardly-oriented firms to have these pieces of ICT equipment at their disposal. When advanced telematics equipment is considered, items such as modems, EFT facilities and ISDN are substantially more prevalent amongst those firms whose markets are more widely geographically dispersed. For example, 66% of both firms who have EFT facilities on-site and of firms who are connected to an ISDN line have foreign customers. 74% of those with modems are firms which export to foreign markets (see Appendix 5.2 for detailed figures).

Geographical remoteness of the market also correlates strongly with the range of uses firms make of their computing facilities. For instance, only 25% of locally-oriented firms make more than three uses of their computers (generally word processing, financial management and producing accounts). This figure compares with 47% amongst nationally-oriented firms and 71% of internationally-oriented firms (see Table 5.12 Part(ii)).

Table 5.12 LOCATION OF PRINCIPAL CUSTOMERS by AVAILABILITY OF ICT EQUIPMENT and USE OF COMPUTER FUNCTIONS

(i) No. of pieces of equipment available	Location of principal customers							
	only local		national		international		no answer	
1	*4*	14.3	*2*	4.4	*1*	1.8	*1*	100.0
2	*7*	25.0	*5*	11.1	*1*	1.8		
3 - 5	*15*	53.6	*24*	53.3	*20*	35.7		
6 - 10	*2*	7.2	*13*	28.9	*27*	48.2		
> 10			*1*	2.2	*7*	12.5		
> mean (5)	***2***	**7.2**	***14***	**31.1**	***34***	**60.7**		
(ii) No. of computer functions used								
0	*15*	53.6	*14*	31.1	*9*	16.1	*1*	100.0
1	*1*	3.6	*2*	4.4	*1*	1.8		
2	*3*	10.7	*3*	6.6	*4*	7.1		
3	*2*	7.1	*5*	11.1	*2*	3.6		
4 - 6	*7*	25.0	*16*	35.6	*30*	53.6		
> 6			*5*	11.1	*10*	17.9		
> mean (3)	***7***	**25.0**	***21***	**46.7**	***40***	**71.4**		
Total no. of firms	*28*		*45*		*56*		*1*	

[**Note:** Figures in italics are raw count of firms; figures in normal type are a percentage of the column total. Shaded cells show the proportion of firms with higher than average technological penetration.]

Relations between advanced telematics services and customer networks

The use and awareness of telematics services and whether or not they will be needed in the future are all strongly related to the geographical distance between firms and their customers. For example, while only 7% of locally-oriented firms currently use telematics services, this figure rises to 36% amongst foreign-oriented firms. Similar trends are seen in the awareness of telematics services and the level of perceived future need for such technology - both increase significantly as the customer base becomes more spatially dispersed. These results indicate that technological penetration is significantly greater amongst more outward-looking firms who are more integrated within the intensifying global market.

A small publishing firm based in Oxfordshire highlights this link between geographically remote customers and the adoption of advanced ICTs.

> The firm, set up in 1987, is privately owned and employs only three people on a full-time basis. Despite its small size, it is significantly integrated within international markets, its principal customers being other businesses and organizations in the UK and Germany. In addition to basic communications equipment such as the telephone, fax, answerphone and mobile phone, the firm also has on-site the use of desk-top computing, a modem and an EFT facility. A wide range of uses are made of the computing facilities, including E-mail, word processing, financial management and generating information for management. In terms of advanced telematics services, EFT, E-mail and EDI are all currently used in the firm. This is likely to be a direct result (or indeed a cause) of the firm's links with distant customers. Which is the cause and which the effect can only be determined through more in-depth research.

Another small printing firm provides a contrasting example in terms of customer linkages and technology use.

> This Winchcombe-based firm, set up in 1979, employs two people full-time in 'graphic design, artwork, printing and finishing'. The firm's customers include both the general public and other businesses and organizations, but all are located within a twenty mile radius, its principal customers being in Winchcombe itself. The firm's adoption of technology is limited to the phone, fax and answerphone. Although the respondent indicates an awareness of the telematics services EFT and EDI, there is no anticipation that these may be needed by the firm in the future. This is as might be expected, given the local nature of the firm's customer base and the subsequent adequacy of its existing technology for its current and projected communications requirements.

Technological penetration and customer type

The level of technological penetration within firms is also strongly related to the types of customers they serve - i.e. whether other businesses or organizations, the general public (i.e. individual consumers) or a combination of both. Most importantly, the perceived need for advanced telematics services in the future is higher among firms whose customers are other businesses or organizations (at 33%) than others who deal only with the general

public (at 16%). See Table 5.13 Part (i). This may be due to better networking of information between firms who supply and buy from each other; hence such firms might have a more extensive range of contacts from which to obtain information pertaining to advanced ICTs (i.e. 'homophily' or the evaluations of peers, as put forward by Rogers (1983)). The same is true of relationships between customer type and both the availability of equipment on-site and the range of uses of computers. 56% of business oriented firms compared with only 36% of firms selling to the individual consumer have access to more than five pieces of equipment (Table 5.13 Part(ii)), while 67% of business oriented firms as opposed to 44% of firms who supply the general public use more than the average number of computer functions (Table 5.13 Part (ii)). These trends are less pronounced in the levels of awareness of telematics services. However, firms serving either the business market or the general public show similar levels of use of telematics services. It is unclear why the use of telematics services among firms does not follow the same trends as the awareness of services or perceived need for services in the future, but it may be related to barriers to adoption such as cost, manpower, skills, or managerial goals. Such factors may mean that, although the information and knowledge of telematics solutions exists, and there is a perceived need for these technologies, insufficient drive or a lack of financial or practical capability within the firm may prevent ideas from becoming reality.

The Gloucestershire position sensors manufacturer referred to previously is one firm in which the awareness of telematics and the perceived need for such services are both comparatively high and yet true telematics are not currently in use. In terms of ICT equipment, the current availability is fairly basic, comprising phone, fax, answerphone and desk-top computer. The computer is used in a wide range of applications, including design and development of products and controlling their manufacture. The respondent indicates awareness of the whole range of telematics services listed and suggests that EDI, teleworking and video-conferencing may be needed in the future. However, none of these services is currently in use. This is most likely to be a result of the firm's youth, having only started up as a part-time venture in 1992 (from the directors' homes) and as a full-time concern at its present site since 1994. The fact that the company is only starting to sell products is likely to severely limit its ability to make the substantial financial commitment necessary to acquire advanced telematics equipment and services. However,

as emphasized in the conceptual framework (Chapter 3), it is necessary to examine in more depth the characteristics of the firm and the external environment within which it is operating to identify with any certainty the reasons for current levels of telematics use.

Finally, in all aspects of technological penetration, those firms whose customer base is a combination of businesses and the general public appear to be less technology intensive than other firms (Table 5.13). Again, although possible reasons for this disparity may be suggested (including, for example, the type of product range manufactured by such firms, or the relative proportions of their business and individual customers), more in-depth qualitative research is required to determine the actual causes of such patterns.

Table 5.13 TYPE OF PRINCIPAL CUSTOMERS by TELEMATICS SERVICES NEEDED IN THE FUTURE, AVAILABILITY OF ICT EQUIPMENT and USE OF COMPUTER FUNCTIONS

(i) No. of services needed in future	Type of principal customers			
	Bus/orgzn	Gen. public	Both	No answer
0	67.2	84.0	86.0	100.0
1	8.2	4.0	4.7	-
2	9.8	8.0	7.0	-
3	13.1	4.0	2.3	-
4	1.6	-	-	-
> mean (0)	**32.8**	**16.0**	**14.0**	**-**
(ii) No. of pieces of equipment available				
1	3.3	16.0	2.3	100.0
2	4.9	8.0	18.6	-
3 - 5	36.1	40.0	62.9	-
6 - 10	45.9	32.0	14.0	-
> 10	9.8	4.0	2.3	-
> mean (5)	**55.7**	**36.0**	**16.3**	**-**
(iii) No. of computer functions used				
0	13.1	44.0	44.2	100.0
1	1.6	4.0	4.7	-
2	6.6	8.0	9.3	-
3	11.5	-	4.7	-
4 - 6	52.4	28.0	32.5	-
> 6	14.8	16.0	4.7	-
> mean (3)	**67.2**	**44.0**	**37.2**	**-**
Total no. of firms	61	25	43	1

[**Note:** Figures are given as a percentage of the column total. Shaded cells show the proportion of firms with more than the average level of technological penetration.]

Technological penetration and the number of customers served

The level of technological penetration within firms appears to be only loosely related to the number of principal customers they serve. Firms serving larger markets, in terms of the numbers of customers they have, appear to be slightly more technology intensive than others when ICT equipment and computer use is examined, but are no different to other firms with fewer customers in terms of their telematics use, awareness and needs (see Table 5.14 Parts(i)&(ii)).

Table 5.14 NUMBER OF PRINCIPAL CUSTOMERS by AVAILABILITY OF ICT EQUIPMENT and USE OF COMPUTER FUNCTIONS

(i) No. of pieces of equipment available	Number of principal customers					
	1	2 - 5	6 - 10	> 10	no ans.	not app.
1	-	-	18.2	1.5	28.6	6.3
2	-	11.8	9.1	7.6	28.6	12.5
3 - 5	50.0	58.8	45.5	45.5	14.3	43.7
6 - 10	50.0	29.4	22.7	36.4	28.6	31.2
> 10	-	-	4.5	9.1	-	6.3
> mean (5)	**50.0**	**29.4**	**27.3**	**45.5**	**28.6**	**37.5**
(ii) No. of computer functions used						
0	-	35.3	31.8	19.7	71.4	50.0
1	-	5.9	9.1	1.5	-	-
2	50.0	-	4.5	10.6	-	6.3
3	50.0	11.8	4.5	7.6	-	-
4 - 6	-	41.2	40.9	47.0	14.3	31.2
> 6	-	5.9	9.1	13.6	14.3	12.6
> mean (3)	**-**	**47.1**	**50.0**	**60.6**	**28.6**	**43.8**
Total no. of firms	**2**	**17**	**22**	**66**	**7**	**16**

[**Note:** Figures are given as a percentage of the column total. Shaded cells show the proportion of firms with more than the average level of technological penetration.]

Overall, therefore, technological penetration in rural manufacturing firms is more intense amongst those whose customers are more geographically remote and among those who serve a business market. There is strong differentiation of the sample in terms of customer location and type.

Relation between technological penetration and supplier networks

Technological penetration in rural manufacturing firms also varies with supplier linkages, although it is the location of suppliers rather than their absolute numbers which appears to differentiate the population of firms more significantly. As with the relationships between customer location and technological penetration, the availability of ICT equipment and the range of uses which are made of computers differ most widely with the geographical dispersal of suppliers. For instance, the proportion of firms having more than five pieces of ICT equipment at their disposal increases more than three-fold from 22% of those firms supplied exclusively from within a twenty mile radius to 73% of those who are supplied by companies throughout the UK and abroad (Table 5.15 Part(ii)). Similarly, when the range of uses to which firms put their computers is examined, firms which are outward-looking in terms of their supply sourcing are much more likely to use greater than the average number of computer functions (i.e. three) than their compatriots who are more inward-looking in this respect (Table 5.15 Part(iii)).

Relation between advanced telematics services and supplier networks

In terms of telematics services, firms currently using them and those perceiving a need for such services in the future are more likely to be those which are outward-looking in terms of their supply linkages. 13% of inward-looking firms (supplied from within a twenty mile radius), 22% of firms supplied from sources throughout the UK and 41% of internationally supplied firms currently use or perceive the need for telematics services in the future (Table 5.15 Part(i)). This relationship is also mirrored in the figures for levels of awareness of telematics services.

Table 5.15 LOCATION OF REGULAR SUPPLIERS by TELEMATICS SERVICES NEEDED IN THE FUTURE, AVAILABILITY OF ICT EQUIPMENT and USE OF COMPUTER FUNCTIONS

(i) No. of services needed in future	Location of regular suppliers				
	Local	Thr'out UK	UK & abroad	No answer	Not applicable
0	87.0	78.0	59.1	100.0	100.0
1	-	8.5	4.5	-	-
2	4.3	7.3	18.2	-	-
3	8.7	4.9	18.2	-	-
4	-	1.2	-	-	-
> mean (0)	**13.0**	**22.0**	**40.9**	**-**	**-**
(ii) No. of pieces of equipment available					
1	13.0	3.7	4.5	50.0	-
2	21.7	9.8	-	-	-
3 - 5	43.5	51.2	22.7	50.0	100.0
6 - 10	21.7	29.3	59.1	-	-
> 10	-	6.1	13.6	-	-
> mean (5)	**21.7**	**35.4**	**72.7**	**-**	**-**
(iii) No. of computer functions used					
0	43.5	28.0	18.2	100.0	-
1	8.7	1.2	4.5	-	-
2	8.7	7.3	9.1	-	-
3	8.7	8.5	-	-	-
4 - 6	30.4	46.3	31.7	-	100.0
> 6	-	8.5	36.4	-	-
> mean (3)	**30.4**	**54.9**	**68.2**	**-**	**100.0**
Total no. of firms	23	82	22	2	1

[**Note:** Figures are given as a percentage of the column total. Shaded cells show the proportion of firms with more than the average level of technological penetration.]

As with the patterns of technological penetration shown by customer linkages, supplier numbers have little bearing on levels of adoption and use of ICTs. As the numbers of suppliers increase, there is a weak gradation in the intensity of technological penetration, both in terms of the availability of ICT equipment and in terms of the awareness levels of respondents. However, there are no other differences between firms with varying numbers of suppliers related to the adoption and use of ICTs.

Table 5.16 NUMBER OF REGULAR SUPPLIERS by AVAILABILITY OF ICT EQUIPMENT and AWARENESS OF TELEMATICS SERVICES

(i) No. of pieces of equipment available	Number of regular suppliers					
	1	2 - 5	6 - 10	> 10	no ans.	not app.
1	100.0	4.3	12.9	1.4	50.0	100.0
2	-	21.7	12.9	5.6	-	-
3 - 5	-	43.5	38.7	48.6	50.0	-
6 - 10	-	30.4	35.5	33.3	-	-
> 10	-	-	-	11.1	-	-
> mean (5)	**-**	**30.4**	**35.5**	**44.4**	**-**	**-**
(ii) No. of telematics services aware of						
0	100.0	52.2	38.7	30.6	100.0	100.0
1	-	8.7	6.5	2.8	-	-
2	-	4.3	6.5	8.3	-	-
3	-	4.3	6.5	9.7	-	-
4 - 6	-	8.7	29.0	19.4	-	-
> 6	-	21.7	12.9	29.2	-	-
> mean (3)	**-**	**30.4**	**41.9**	**48.6**	**-**	**-**
Total no. of firms	1	23	31	72	2	1

[**Note:** Figures are given as a percentage of the column total. Shaded cells show the proport on of firms with more than the average level of technological penetration.]

Thus it is clear that the relationship between the spatial dispersal of suppliers and technological penetration (particularly in terms of current use and predicted future need, rather than simply awareness of advanced telematics services) is one which is of central importance. It is likely that this is partly a function of the fact that a firm's links with its suppliers will necessarily be stronger than those with its customers. The relationship between customer and supplier is generally a highly directional one, in which the customer

has more need to contact the supplier than vice versa. Production is entirely dependent on raw materials/components supplied and the customer must place regular orders with the supplier. These contacts are generally more frequent and are required more urgently than the invoicing which is initiated by the supplier. Hence, a firm's ICT strategy is more likely to be geared towards satisfying the need to be in contact with its suppliers and the relationship between technological penetration within the firm and the characteristics of its supplier linkages is therefore likely to transcend other trends. Similarly, these suppliers will be more geared to communicating with those who supply them than with their customers who necessarily, due to the uneven nature of the relationship, will 'come to them' instead.

Technological penetration and other factors

Several additional relationships between firm characteristics and rates of adoption and use of ICTs are apparent and, although less influential than those based upon the characteristics of customer and supplier networks, they do warrant brief coverage here. Technological penetration in the rural manufacturing economy also varies according to the type of product made (defined here by industrial sector). However, although some notable trends are evident, it is important that they be regarded in the light of variation in both the product and the technical sophistication which is required to make it which occurs within sectors and, indeed, within sub-sectors and the resulting implications of this variation for the technology needs of respective firms. Furthermore, the analysis reports correlation at sectoral rather than sub-sectoral level, since in some sub-sectors there are so few firms that any conclusions drawn would be dubious.

The greatest difference between sectors is in the current levels of use of advanced telematics services. 31% of engineering firms compared with 17% of other manufacturing firms currently use telematics. Levels of awareness of telematics are also higher in the engineering sector. Examining availability of ICT equipment, technological penetration is, again, greater amongst engineering firms than amongst other manufacturing firms in this respect. In addition, of those who have computers, engineering firms make a wider range of uses of computing functions than other manufacturing firms.

Further relationships with ICT adoption and use also exist between ownership type and size of firm. In all respects, technology penetration is substantially greater in firms owned by partners or shareholders than in those owned by individuals or family groups. Similarly, there is a correlation between the extent to which new information and communications technologies have penetrated a firm and the number of employees working there. The larger the workforce the more likely it is that the firm will have access to a wide range of equipment and that telematics will be used. This is likely to be related to both the greater investment power of larger firms and their ability to devote specifically trained employees to use, develop and maintain ICT applications.

5.4 Implications of findings

This chapter has explored the rural manufacturing economy of the Cotswolds and South Warwickshire, examining variations in the general characteristics of firms and the extent to which new advances in information and communications technologies have been taken up by firms in the area. Analysis of information obtained from the survey of more than 300 businesses suggests that this is a two-tiered economy composed of 'inwardly-oriented firms' which are entirely embedded within the local rural economy, whose suppliers and markets are situated within a twenty mile radius and which make little use of ICTs; and a significant number of 'outwardly-oriented firms' which reach far beyond the local area both for raw materials and components and for custom and which tend to make extensive use of a wide range of ICTs, with a few also using advanced telematics technologies. Clearly, such division of the economy has implications for both further research into the uptake and adoption of ICT and policy and it is these which are the focus of this section

Analysis has revealed that, although there are many relationships between firm characteristics and technology penetration, the most notable factor differentiating the population of firms in terms of their adoption of technology is the nature of their customer and supplier linkages. The relationship between the location of suppliers and the uptake of ICTs transcends all others. These findings raise the question of whether the use of more advanced ICTs allows firms to expand into more distant markets and sources or whether they have been forced to innovate in order to retain previously established distant linkages as technology has advanced. It also leaves unanswered many other questions relating to

why certain firms have or have not adopted advanced technologies, including the question of whether it is due to external pressure, from outside the local rural area, initiated by customer or supplier contacts, or whether it is internally driven, initiated by the entrepreneur or management team.

The results of the extensive survey also raise a number of issues with regard to policy making in rural areas, particularly that which is concerned with small rural businesses and development of the use of advanced ICTs. The fact that the population of rural firms in the Cotswolds and South Warwickshire is so heterogeneous calls into question the use of 'blanket policies' and suggests that rural development agencies and policy makers need to recognize this diversity and tailor their endeavours to the needs of different groups of firms in order to be truly effective. These issues are further developed in Chapter 7.

The next stage of the research, therefore, is designed to develop these central themes further. This 'intensive' stage, based on face-to-face semi-structured interviews with selected respondents to the postal questionnaire survey, is detailed in Chapter 6. It examines in detail the evolution of the individual firm to the present day, including the development and current roles of both customer and supplier networks, the history of the firm's use of ICT equipment and services and the causal relationships between these factors. The role of the entrepreneur or managing director, her/his personal characteristics (including age, educational and skills background, dependants, attitudes and goals) are examined. The way in which she/he makes decisions, both about the general running of the firm and concerning ICT acquisition, use and development, are explored in detail. In addition, the sources of information and advice used by the decision-maker(s) are probed further, informing the final stage of the research - the intensive survey of external agencies and institutions (detailed in Chapter 7). In this way a fuller picture of the key individuals and decision-making processes internal to the firm, the networks of businesses and organizations external to the firm and how the use of ICTs within the firm is related to these processes and networks may be constructed. Thus a greater insight into the opportunities and constraints facing individual firms is obtained and a deeper understanding of the means by which new technologies are taken up by rural firms may be developed, both of which, in turn, may be used to inform rural policy makers and agencies.

5.5 Chapter summary

A number of key issues have been raised by the extensive survey of rural firms:

- The rural economy surveyed consists of two main types of firms defined by the local embeddedness of their operations: *inwardly-oriented firms* whose suppliers and customers are located within the local rural area and who make little use of advanced ICTs and *outwardly-oriented firms* which serve and are supplied from businesses far beyond the local rural area and who make extensive use of advanced ICTs.

- Levels of technological penetration vary most significantly with the geographical location of suppliers, but technology use and awareness of telematics services are also higher in firms whose customers are more geographically remote and those who serve the business market rather than the general public.

- Technological penetration varies by industrial sector, with engineering firms using a higher number of ICT applications than their manufacturing counterparts - this may be related to the fact that engineering firms produce more technically sophisticated products and those surveyed were supplying to a numerically larger and geographically wider customer base.

- Technological penetration is substantially greater in firms which are owned by partners and shareholders than those under family ownership - this is likely to be related to the fact that family-owned firms are, on average, smaller than others.

- A rural economy in its traditional sense does persist, but only in a minority of cases; most firms in the area have a strong dependence on external trade links and only one fifth supply and buy exclusively from the local rural area.

- A diverse range of products is made in the area, but manufacturing firms account for two thirds of the sample, engineering for the remaining third.

- Micro-enterprises (employing ten or fewer people) account for more than two thirds of the population and part-time employment is important, especially in smaller firms.

- The nature of causality between technological penetration and these various factors may be inferred from these findings, but in order to explore this in detail a more in-depth examination of the decision-making processes which give rise to these patterns of ICT adoption is necessary; this entails the use of qualitative research techniques.

Chapter 6

FACTORS INFLUENCING UPTAKE AND USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGIES IN RURAL BUSINESSES

6.1 Introduction

The previous chapter highlighted the nature of the rural economy under scrutiny, identifying a variety of different types of firm in terms of their levels of penetration of information and communications technologies (ICTs). The findings of the extensive stage of the research suggested that a two-tiered economy exists which contains, at one end of the spectrum, firms which have relatively high levels of technology uptake, many of which use advanced telematics services, and, at the opposite end of the spectrum, firms which have very low levels of technology penetration, some only using the most basic of telecommunications, the telephone. The findings further suggested that these levels of ICT penetration among rural firms correlate strongly with the linkages they have with both suppliers and customers. Firms whose customers and suppliers are more numerous and geographically distant and those whose customers are other businesses and organizations, as opposed to the general public, were shown to have generally higher levels of technology penetration than other firms. These findings raised some key questions as to why some firms appear to have a greater propensity to adopt new ICTs than others and how exactly this relates to the relationships previously identified. In addition, the question must be asked as to whether the extensive nature of customer and supplier linkages possessed by firms with high technology use are the cause or the result of such high levels of technology penetration. It is the purpose of this chapter to address these questions.

The extensive phase of the research followed an essentially positivist behavioural methodology, in that it was concerned with discovering patterns and generalizations concerning the uptake of ICTs amongst the rural firms. This extensive research provides *indirect* explanations only; intensive methods are necessary to provide *direct* explanations of the processes which are operating. In order to examine the questions raised by the findings of the extensive research phase, the methodology employed needed to incorporate personal attributes such as perceptions, goals, values and motives of key entrepreneurial individuals within these firms. Such factors are recognised by behaviouralist philosophy

as important aspects of active processes (such as that of the uptake of advanced information and communications technologies). However, methodologies based upon positivist behaviouralism tend to aggregate results, rather than look at the level of the individual firm. In addition, such research does not have the facility to identify the cognitive processes which link perception with behavioural response.

As a result, this phase of the research uses a qualitative methodology derived from the principles of humanist thinking. Humanism focuses on so-called experiential environments (for more detail refer to Chapter 3, section 3.2.5), highlighting the meanings ascribed by human beings to their surroundings. The individual is considered as a thinking being with intentionality. Furthermore, humanism recognizes the uniqueness of individual actors within the environment. Consequently, each firm is treated as a unique and separate entity existing within the rural economy. Humanist-derived methodologies are ethnographic in nature and aim to gain an understanding of the thought processes behind individuals' decision-making, thereby representing an ideal tool with which to examine the factors influencing adoption or non-adoption decisions made by entrepreneurs.

Humanist approaches aim to improve understanding rather than to explain or predict processes. The primary aim of this stage of the analysis is, therefore, neither to make generalizations nor to categorize (procedures characteristic of positivist work), but to find reasons for the patterns of technology uptake identified, through the study of individual firms and decision-makers. In the final synthesis stage of analysis, it is necessary to perform a degree of generalization, however, in order to evaluate the impact of current strategies and to inform future policy development.

Hence, a qualitative methodology was used which involved the intensive semi-structured interviewing of selected respondents from the extensive postal questionnaire survey. These interviews (of up to two hours' duration) were designed to obtain in-depth information pertaining to the firm itself and the key individuals involved in the decision-making processes within the firm. Questions probed interviewees further on issues of internal and external factors affecting the propensity to adopt ICTs, which were initially proposed in the conceptual framework and subsequently raised by the extensive survey.

These included factors such as the background and evolution of the firm, the type of product made and any back-up service provided to the customer, the types of customer and supplier linkages, the levels of ICT use within the firm, the personal characteristics, opinions and attitudes of key decision-makers and the pathways through which the decision-making processes within the firm are directed. Decision-makers were also questioned about the concept of rural development: how they perceive it and how they believe their adoption or non-adoption of ICTs might exert impacts on the development of the local area. The methodology is fully detailed in Chapter 4 (section 4.4.1).

Four key findings emerge from this qualitative work. Firstly, the *product* made by the firm is of crucial importance since this determines the types of markets in which it operates and, hence, the overall levels of technology prevalent in such markets. Closely related to the product type, the back-up service provided by the firm (e.g. in some cases on-line help to customers is provided to support the product dispatched) can influence whether or not a firm needs to be technologically advanced in terms of its communication of information. Secondly, the *personal characteristics* of the decision-maker and his her importance in the decision-making processes are crucial determinants in the type of business solutions sought (i.e. whether or not advanced ICTs are seen as integral to these solutions). Thirdly, the *pathways* through which decisions are directed before the final outcome emerges have a bearing on the uptake of ICTs. Finally, the *structure of the company*, i.e. the extent to which the firm is part of a multi-site/multi-national entity determines its own internal needs for advanced ICTs - this is often a result of how the firm has evolved historically. These findings are presented in the following sections (6.2 to 6.6).

This chapter explores the roles played by these various factors in the adoption behaviour of firms, as a direct result of their pivotal role postulated in the conceptual framework. The chapter also examines the perceptions of decision-makers. In particular, their opinions on the impacts of their ICT adoption behaviour and their views on the role of ICTs in promoting rural development are analyzed. Customer and supplier linkages, decision makers and product types are examined in turn, building up an increasingly complex picture of the interaction of influencing factors, section by section, to explore the nature of

causality between these factors. The analysis is illustrated with case study evidence and direct quotations from interview transcripts.

6.2 The role of external factors in ICT adoption - customer and supplier linkages

The findings of the extensive stage of the research suggested strong links between the levels of technology uptake in rural firms and the types of customer and supplier networks they have. The intensive interviewing of key individuals in some of these firms reveals a wide range of linkages with various customers and suppliers in the local area, throughout the UK and abroad. Some of these linkages do appear to exert an important influence on the technology adoption behaviour of certain firms, while other firms seem to be more or less unchanged by such external agents, their technology uptake being driven from within.

Customer and supplier linkages develop in various ways for a number of reasons. Most commonly, they are a direct result of the type of product manufactured by the firm and, hence, the nature of the markets in which it must operate. In other cases, they arise from a whole chain of events spanning the historical evolution of the firm. In still further cases, the key individuals acting within the firm may directly influence the types of customers or suppliers with which the firm deals through their own personal networking experiences and capabilities within the industry.

This section examines, in detail, the correlation between types of customer and supplier linkages in selected rural firms and levels of technological penetration, in order to determine the direction of causality in this relationship. Table 6.1 provides details of the twenty intensively surveyed firms, their customer and supplier linkages and their levels of use of ICT equipment and services.

Table 6.1 Firm characteristics, customer and supplier linkages and ICT adoption

Firm no.	No. of employees	Ownership	Product made/ service provided	Customer & supplier linkages	ICTs used
1	255	Family	Original equipment for automotive industry (suspension & exterior trim parts)	C - 20 world-wide S - 85 world-wide (60% of exports go to Europe)	Phone, fax, ansph, D/Ts, L/Ts, modems, Internet (vid'conf'g - near future)
2	16	Partners	Design & manufacture electrical control systems for refrigeration, air conditioning, heating & ventilation	C - large international refrigeration contractors world-wide S - throughout the UK	Phone, fax, ansph, mobph, D/Ts, L/T (E-mail planned)
3	25	Family	Manufacture, erect & repair road signs; manufacture traditional aluminium castings	C - throughout the UK (mainly Oxfordshire & Derbyshire) S - hundreds throughout the UK	Phone, fax, ansph, D/Ts, L/T, CD-rom
4	10	Partners	Manufacture bespoke joinery, windows, doors and conservatories	C - throughout the UK (about 30% in local area) S - throughout the UK, but prefer local	Phone, fax, ansph, D/T (want EFT near future)
5	1	Individual	Printing, publishing, graphic design & photocopying	C - mainly local S - mainly local, furthest is Milton Keynes	Phone, fax, ansph, D/T
6	15	Family	Design & manufacture sub-surface drilling instrumentation & sensors (oilfield & utilities markets)	C - world-wide, mostly US S - about 100, within 100 miles (also some abroad, but prefer to buy 'local')	Phone, fax, ansph, D/Ts, L/Ts, modems, EFT, CD-rom, scanner, E-mail, EDI, teleconf'g
7	15	Shareholders	Design & manufacture sensors for the automotive industry; industrial applications of torque transducers	C - international automotive companies world-wide (esp. US) S - UK & abroad	Phone, fax, ansph, mobph, D/Ts, L/Ts, modem, CD-rom, scanner, LAN, Internet, E-mail (ISDN & vid'conf'g imminent)
8	10	Family	Bespoke furniture from English hardwoods (in traditional style)	C - general public throughout the UK & some businesses S - throughout the Midlands	Phone, fax, ansph, mobph
9	8	Individual	Design, manufacture & distribute teleprocessors - circuits & software	C - Health Authorities throughout the UK S - 'very few'; one in Taiwan, rest local, esp. Cheltenham	Phone, fax ansph, mobph, pager, D Ts L/Ts, modems, SDN satellite, V deotex ED E-mail, te ework ng LAN (may need EFT)
10	14-30 (seasonal)	Partners	Process, pack & distribute dried fruit & nuts	C - throughout the UK (mainly large supermarkets) & a few abroad S - UK & abroad (inc. Zimbabwe & Turkey)	Phone, fax, mobph D/Ts, L/T, EDI

Key to abbreviations:

ansph	answerphone	L/T	lap-top computer
C	customer linkages	mobph	mobile phone
D/T	desk-top computer	S	supplier linkages
esp.	especially	teleconf'g	teleconferencing
inc.	including	vid'conf'g	videoconferencing

Table 6.1 Firm characteristics, customer and supplier linkages and ICT adoption (contd.)

Firm no.	No. of employees	Ownership	Product made/ service provided	Customer & supplier linkages	ICTs used
11	50	Individual	Automotive design, prototype build & manufacture; oil rig drilling platform design	C - large automotive companies UK & abroad S - few, UK only	Phone, fax, mobph, pager, D/Ts, L/Ts, modems, ISDN, CD-rom, scanner, LAN, EDI
12	435	Shareholders	Assemble & distribute upholstered furniture	C - retailers all over the UK S - UK & abroad (esp. Europe)	Phone, fax, pager, D/Ts, L/Ts, modems, ISDN, CD-rom, optical reader, LAN, EDI, E-mail, teleworking
13	3	Shareholders	Design & manufacture position sensors for hydraulics, ship stabilisers & jet skis, etc.	C - world-wide S - approx. 20 all within a 20 mile radius	Phone, fax, ansph, D/Ts (installing LAN)
14	22	Family	Polymer products, moulds & patterns; compound & formulate mould, tooling & prototype resins	C - general industry UK & abroad S - throughout the UK; also Japan & Germany	Phone, fax, mobph, D/Ts, L/T, modem, scanner, LAN, EFT, E-mail, (ISDN 'imminent')
15	180	Shareholders	Manufacture filtration paper for automotive & air filtration industries, etc.	C - UK & abroad S - UK & abroad	Phone, fax, ansph, mobph, pager, D/Ts, L/Ts, modems, optical reader, LAN
16	13	Partners	Assemble, pack & distribute automotive gasket & wheel bearing sets	C - UK S - UK & abroad	Phone, fax, mobph, D/Ts, modem, ISDN, LAN
17	105	Shareholders	Publish children's educational books, teachers' magazines & language magazines; run Bookclubs and Bookfairs	C - UK (WHSmith, Dillons, & other big chains) also schools S - UK & abroad	Phone, fax, ansph, mobph, pager, D/Ts, L/Ts, modems, ISDN, optical reader
18	1	Individual	Publishing, printing & bookbinding	C - 50% local businesses, 50% countrywide (esp. undertakers) S - very few (Banbury, Abingdon & London)	Phone, fax, ansph, D/Ts, modem, CD-rom, scanner, E-mail
19	451	Shareholders	Manufacture compressed air processing equipment (filters, regulators & lubricators) for drinks dispense, garages, dentists, cash dispense machines, pneumatic cylinders, etc.	C - throughout the UK & Europe (60% to EEC countries) S - 180 throughout the UK & abroad (mostly UK)	Phone, fax, ansph, mobph, pager, D/Ts, L/Ts, EFT, EDI, vid'conf'g, ISDN2, CD-rom, LAN
20	9	Family	Aluminium finishing & powder coating	C - approx. 60 throughout the UK S - UK & abroad	Phone, fax, ansph, mobph, D/T, modem, EFT

Key to abbreviations:

ansph	answerphone	L/T	lap-top computer
C	customer linkages	mobph	mobile phone
D/T	desk-top computer	S	supplier linkages
esp.	especially	teleconf'g	teleconferencing
inc.	including	vid'conf'g	videoconferencing

The influence of customers and suppliers appears to vary widely between different firms. Some firms, for example, have been very much forced by their major customers to become more hi-tech in their communication of information. These customers, already operating within a global market, exert an enormous amount of power over many of their smaller, and to a large extent dependent, suppliers and can insist they also become involved in this process of globalization. Two striking examples of this pressure from customers emerged from the intensive survey. Firm 1, one of the larger firms involved in the survey, employs 255 people. A manufacturer of original equipment to the automotive industry, this firm produces suspension and exterior trim parts for companies such as Ford, Volkswagen and General Motors. These customers are relatively few (only twenty), but locationally they are dispersed world-wide. 60% of what is produced by the plant is exported to Europe (mainly Portugal, Spain, France, Germany and Belgium). The importance of maintaining regular and effective contact with big customers is highlighted in this comment made by the interviewee, the firm's Commercial Manager:

> "Our main customer is Ford ... and we supply every Ford plant in Europe every day of the week."

The nature of the network of customers, both in its dispersal and in the types of companies it comprises (i.e. they are all very large, powerful multi-national automotive companies), has led to extreme pressures being put on the firm to become more technologically advanced in terms of its ability to communicate information to customers.

> "The communication within the company, as well as with its customers and suppliers, is not the same as it was ... we now have, with our major customers, we have paperless transmissions ... we have direct contact into their mainframe computers. So we have this with Ford in every location in Europe and we now also have it on a global basis through to the States."

The interviewee explained how the firm has been gradually forced into adopting such equipment and services:

> "... we found that we were led by our customers because if you have not got the type of equipment that allows you to receive information then you won't be able to talk to them,

> so it will exclude you from dealing with Ford or Volkswagen or anybody, because if you're not on the Internet they won't have faxes anymore."

The interviewee repeatedly stressed the pressure from large customers as the main driving force behind the ICT adoption strategies of the firm.

> "You are being forced down that route that, as the majors get involved, you have to follow them, otherwise you are excluded."

Furthermore, when asked about the main factors taken into account when making decisions regarding new ICT acquisitions, he replied:

> "... the main factors, I think, for a company of our size, in any decision, is to look at what the general trade is doing. It is the larger companies that set the trends... If the Fords and the General Motors and the Volkswagens want to put these systems in, then we are very much dictated to by them. So, we don't have a requirement of our own. Our requirement is on us from our customers."

The interviewee was further questioned specifically about such decision-making:

> "So it's always an external pressure which forces such decisions?
> Yes - absolutely."

In addition, the interviewee suggested that if the firm was to continue to be successful in the future, its ICT strategy would continue to be driven in such a way:

> "... I would think that we are going to have to improve our ability to design and manufacture through computerized systems linked directly to our customers."

This exemplifies the influence which large multi-national companies can exert upon the decision-making processes of their smaller suppliers and highlights the strong linkages, and indeed dependencies, which are present (and are likely to remain) between some of the rural firms in the study area and some of the world's largest multi-national companies (i.e. they are locked into the supply chain which is controlled by larger organizations). It is noteworthy that this is in spite of the fact that some of the firms surveyed are relatively

large by rural standards (for example, 255 employees). The imbalance in such relationships leads to the conclusion that the rural economy is, in fact, being driven, to a large extent, by some major international economic players acting far beyond its geographical limits. Whether or not the rural economy benefits from these external forces is likely to depend on individual, place-specific circumstances. These issues are discussed in more detail in Chapter 7.

Another example typifying the effects of the policies of large companies on the actions of their smaller suppliers in terms of ICTs came to light during an interview with the Production Manager of Firm 10. This firm processes, packs and distributes dried fruit and nuts for customers throughout the UK and abroad. Most of the larger customers are the big supermarket chains, such as Waitrose, Sainsburys and Budgens. As these supermarket chains have become more technology intensive in their communication of information, they have gradually put more and more pressure on their suppliers to follow them down that route. The interviewee said of the firm's use of telematics services:

> "We're actually on EDI ... we actually installed it for Waitrose. Most companies now, or most supermarkets, are saying now they want us to go onto EDI ... and it's sort of compulsory to do EDI, to go onto EDI, for Budgens, before you can actually supply. And now an awful lot of companies are doing it - Sainsburys, Waitrose ... they've been doing it for years, but it wasn't necessarily compulsory ... but now they've been pushing the suppliers to go onto it."

The fact that EDI has now become a pre-requisite for firms who wish to be preferred suppliers to some of these large chains is an extreme case of intervention in the ICT adoption decision-making processes within rural firms. Such decisions by large firms outside the rural area could seriously affect the rural economy by intensifying the process of marginalization of those rural firms who are unwilling to break with tradition or who are financially unable to invest in advanced telematics systems. If such firms are marginalized to the extent that they are put out of business, much of the original character of traditional rural industry and, hence, rural areas themselves could be lost. This should be cause for concern from the point of view of rural planners and policy-makers.

Customers may also intervene in the ICT adoption strategies of firms more directly and practically by actually determining/specifying the type of equipment or service to be used within the firm. For instance, Firm 11 supplies a wide range of companies, world-wide, in the automotive industry, including General Motors, Leyland Daf, Rolls Royce, Ford, Renault and Nissan. Its largest customer is Rover, which has a plant only twenty miles away. Despite this relative proximity, Rover was so anxious that the firm should 'go on-line' that they actually designed the systems it was to use. The Business Improvement Manager interviewed said:

> "Rover wanted us to make sure that we had networking capabilities. They designed the ISDN links and we have got links within the group now, but you can ... say the London office - if they want a file that's here, they can pull it off. It takes time and the number of times you need to do it are very rare."

As can also be gleaned from the comments above, this system is, as yet, of very limited use, currently being used for communication only with one large customer and for internal communications between sites within the group. Communication with other customers is purely by phone and fax. However, the value to the company of this on-line system, although it currently appears minimal, is that it allows the firm to remain a preferred supplier within the manufacturing supply chain, thus making its future more secure.

The influence of customers is not always so extreme, however. It was revealed that, in the case of some firms, the effects of larger customers pushing forward, in their drive to become more technologically advanced in their communications links, are to instil fear in the decision-makers of their smaller suppliers. If these smaller firms do not keep in mind the possible future needs for advanced telecommunications technologies and prepare to invest in these, they may be 'left behind' in their market. Firm 14's Managing Director said of the possible future need for EDI to communicate with customers:

> "We deal with some large multi-national companies and when you speak to these companies, the impression is they will be using that and if we want to communicate with them ... perhaps in five or ten years' time (though every time I say that it happens the following year!) - so we need to start going down that road now. ... I want to be prepared when we need to use it."

This evidence suggests that some large companies may gradually manipulate the technological investment policies of their suppliers over the medium to long term.

Conversely, in the case of other firms, the effect of customers and/or suppliers works in the opposite direction, discouraging decision-makers within such firms from investing in ICT equipment and services. This is likely to occur when neither customers nor suppliers are in a position to communicate by advanced technologies and hence there is no benefit to be gained from having such capabilities. The value of a network is ultimately dependent on the number of users it has (Capello & Nijkamp, 1996). Hence, if your peers are not implementing advanced ICTs there is no value in investment in such networks. Such firms might be termed 'laggards' in Rogers' 1983 typology of innovators (refer to Chapter 3, section 3.2.2, Figure 3.2). One such firm is Firm 3, a manufacturer, erector and repairer of road signs and producer of traditional-style cast aluminium sign posts and plaques. The majority of this firm's dealings in the road signs area of the business are with County Councils and District Councils as far afield as Derbyshire. This is due to the effect which distance travelled and, hence, time have on the ability to carry out the work associated with the delivery and installation of the product:

> "... we try to keep as close to home as we can because ... it means they *(the erectors)* have to travel a long way and when they travel a long way they can't do as much work when they get there, hence we're gonna be expensive."

The firm has not put a great deal of investment into technology apart from fax and some basic standalone (i.e. not linked to other computers either within or outside the firm) computing facilities for reasons related to the types of customers and suppliers it has:

> "... the majority of companies - District Councils, etc. - that we deal with, they all have dedicated fax lines, hence why it's become so important to us now."

> "... because everybody's advanced, you know, we buy a fax. We buy a computer - everybody else has bought one. Effectively you're still at the same stage as somebody on horseback taking a letter, because everybody else is doing the same thing."

The reluctance to invest in advanced telematics services stems both from a particular preference and from the nature of the market in which the firm operates. For example, when asked about whether EFT might be a useful service, the interviewee replied:

> "We like to deal with cheques ... when it's arrived, we've seen it, we know it's there ... A lot of the firms like to use it *(EFT)* - we don't ... it would never, ever be any use to us. ... a lot of the people we deal with wouldn't have the facility anyway."

When asked about the potential for the adoption of any telematics services in the future the interviewee replied:

> "If everyone in the country suddenly decided they were gonna get these toys then, obviously, we'd say, 'fair enough - everybody's got it - we're gonna get it' ... if it becomes like fax in the future, then you're with it."

This example serves to highlight the fact that the influence of their suppliers and customers does not always act in such a way as to encourage firms to become more technologically advanced in terms of information communication, but can actively discourage them from investing in ICTs. This firm is also very much influenced by other factors, including the attitudes and experience of the entrepreneur which will be discussed extensively in section 6.4.

Clearly, the principal findings of the extensive survey have been borne out by the intensive qualitative work, in that the customer and supplier linkages of firms play a role in the internal decision-making processes regarding the adoption of ICT equipment and services. However, the qualitative stage of the research has shown why these external actors affect the decision-making behaviour of firms and to what extent this is true of various different firms. Firms locked into unequal relationships with large international companies tend to be subject to pressures from such companies to invest in advanced telematics services in order to remain in these markets. Firms whose regular customers or suppliers are smaller concerns tend not to be similarly regulated by them and, in fact, may find themselves in a situation where the low levels of technology used by their regular contacts render any

suggestions or thoughts of investment in advanced ICTs something of a white elephant since there would be no benefits to be gained.

Evidently, there are many other factors at work in determining decision-making behaviour, some of which also have a bearing on the types of customer and supplier networks within which firms operate. The type of product made by the firm and any back-up service provided are key determinants in this instance and are examined more closely in the following section.

6.3 The role of internal factors in ICT adoption - products made and services provided

Given the importance of the links firms have, particularly with their customers, but also with their suppliers, it is pertinent to examine the reasons for the existence of such links. When considering the nature of causality, it is important that the source from which such networks originate be taken into account. The type of product a firm manufactures and, indeed, the way in which it evolved historically, are key factors in the development of customer and supplier networks and are therefore indirectly responsible for the ways in which decisions are made in the internal firm environment.

Firm 6, due to the applications of its product (sub-surface drilling equipment for the oil-rig and utility industries), does most of its business with customers in the US, in particular, Houston. The Managing Director interviewed said on this subject:

> "Well, our products go world-wide, but it tends to be, because we're focused in the oilfield and what we call the utility drilling industry *(i.e. laying cables, etc. for telecommunications companies)*, which is being led in the US, both those buyers tend to be centralized in the US and then the product be distributed by those people outside. So, in general, most of our equipment is exported and thereafter it could go anywhere. We don't have any control over it after that, but anywhere really where there's oilfield activity, from the Soviet Union, Russia now, CIS, right through to the Northern States and Latin America..."

This firm has about a hundred suppliers, most of which are fairly local, within about a hundred mile radius, but some of which are foreign:

> "we do have suppliers from abroad where we can't buy certain components and so forth, but generally we're a bit parochial on that front - we tend to try and support local business and, if that fails, UK business."

The level of ICT use within this firm is relatively high, with the advanced telematics services EFT, E-mail and EDI in regular use. The use of these services is primarily to enable the company to be more responsive to both its customers and suppliers. At the time of interviewing, the firm was only beginning to use E-mail:

> "In terms of E-mail, that's an interesting one. We're at the moment literally hooking ourselves up to Internet and trying to provide on-line service to our customers."

Suppliers have been the main reason for the introduction of EDI in this firm:

> "EDI is something that we are using already - not to its full capability, but we're using it to transfer technical documentation to certain suppliers and so forth, where there are certain formats of data which are ... standardized ... and, in terms of electronic interchange, we can readily just transfer a file format and that can be interpreted by our supplier ... he doesn't have to touch a keyboard ... it's time saving, it's integrity of data - it's just the whole chain of events, the whole supply chain gets cut down. So that, primarily, is our EDI requirement and our driver for doing that."

The needs of customers, on the other hand, have directly influenced the adoption of E-mail:

> "E-mail is more out of convenience to our customers. ... a source of competitive advantage for us. I think we're in a hi-techy, freaky environment where people are just - they love that sort of thing - they think it's quite sexy."

So, again, both the customer and the supplier have influenced the firm's ICT strategy through the type of product manufactured and the back-up service which accompanies it. The uptake of other forms of telematics service, however, is affected conversely by the type of product manufactured. The interviewee said of videoconferencing:

> "... the visual need is not there with our products - we're not trying to sell, you know, aesthetic items!"

The importance of the type of product manufactured in determining the customer and supplier linkages of a firm and, hence, its propensity to use advanced ICTs is also clearly exemplified by Firm 8. In this case, the product made is traditional-style wood furniture, the market for which is composed mainly of members of the general public throughout the UK. Communication in this respect is hence mainly by telephone and only rarely by fax. However, some customers are other businesses and organizations (e.g. the Rural Development Commission) and, in this area of the business, although the main bulk of communications are by telephone, there is increasing use of fax. On the supply side the firm's contacts are mainly with companies who supply traditional basic raw materials such as timber. Such firms traditionally are not greatly concerned with hi-tech communications, supplying as they do the local area, and there is therefore no incentive for firms such as Firm 8 to invest in such equipment, since no-one else in its immediate customer or supplier networks would be contactable through these media. There could, in this case, be said to be a type of 'group inertia' regarding progressive innovative communications technologies.

A firm which contrasts markedly with this example is Firm 9 which develops and manufactures teleprocessors and associated software. These teleprocessors incorporate a modem and are used for the communication of specialist information about public health matters between Health Authorities throughout the UK. In effect, the teleprocessor sorts information from an electronic mail service, ensuring that important information is brought to the attention of the end-user by a series of different coloured flashing lights. As a direct result of the product manufactured by this firm, its communications with its customers are relatively advanced, being almost entirely by electronic mail. Communications on the supplier side, however, are currently exclusively by phone and fax. This is about to change, though, as the Managing Director explained:

> "Well, one of our interests in the Internet is going to be communicating through the Internet for purchasing and that sort of thing. We have an associated company in the States who are particularly pioneering this ... because the United States government have

> said that, as from April 1997, if you wish to purchase or sell anything to the United States government, you're going to have to do it with EDI. If you don't, they won't buy it from you - it's as simple as that."

While illustrating the Managing Director's future plans to upgrade communications with suppliers, making use of advanced telematics services, this quote also re-iterates the existence of external pressures on smaller companies which supply large businesses or organizations, clearly showing that this is something which is occurring not just in the UK, but on a global basis.

The importance of the product manufactured in determining the type of markets in which firms must operate and, hence, the types of firms with which they have contact, is further exemplified by those firms who supply the automotive industry (for example, firms 1, 7, 11 and 16 - refer to Table 6.1 for details). The market in which the manufactured products of these firms are used is dominated by a relatively small number of very large multi-national companies. The customer networks of these small firms are very advanced in terms of their communications technologies because they are operating in a truly global marketplace. Thus it can be seen that small suppliers to the automotive industry become locked into unequal relationships with very large multi-national automotive companies simply because of what they produce. Therefore, in this case, the product made can be said to exert an overriding influence on the types of ICTs adopted by these firms, through the customer networks which they must develop in their particular market.

Thus, the type of product made is a causal factor in determining the customer and supplier linkages of firms which, in turn, are causally related to the adoption of ICTs. However, in all of these firms, other factors are also extremely important in determining the enthusiasm with which the new ICTs have been and are being embraced. Influential factors include the personal backgrounds, motivations, attitudes and goals of the decision-makers, which are examined in detail in the following section.

6.4 The role of internal factors in ICT adoption - decision-makers and decision-making pathways

The philosophical standpoint from which this research is conducted, a humanistic behavioural approach, considers the adoption of ICTs by rural firms and the associated developmental impacts as phenomena which are intrinsically shaped by human agency. This derives from the fact that ICTs alone cannot produce impacts; these are only created through their use. Thus, the processes of uptake and use of these technologies in rural firms and, hence, any potential rural development impacts are a function of the personal characteristics, perceptions and actions of key individuals acting within such firms. An understanding of both the decision-makers in these firms and the pathways through which decisions are made are therefore crucial precursors in the search for explanations as to why some firms have a greater propensity to adopt ICTs than others and why the impacts of this adoption vary between different firms. This section examines the role of the individual decision-maker (or the decision-making body) within the firm and the decision-making behaviour of this individual (or body) in an attempt to identify the characteristics which are influential in the process of ICT uptake.

Information pertaining to both the personal characteristics of the decision-maker and their position of responsibility in the decision-making processes within the firm were derived through the semi-structured interviews. The ways in which decisions are made in firms were also explored. Table 6.2 (shown in four separate sections) summarizes some of the information relating to the key individuals in the firms surveyed, including details of the position which they currently occupy within the firm, their approximate age, educational background, skills and experience in the industry, their own opinions on their potential to take risks and, finally, their attitudes to ICT use in the workplace, particularly in the rural environment.

Table 6.2 Personal characteristics of decision-makers *(Part 1 of 4)*

Firm no.	Decision-maker							
	Position	Age	Gender	Dependants	Education	Skills & Experience	Risk-taker?	Attitudes to ICTs
1	Commercial Manager	45	M	no information	left school at 16 "I'm not into qualifications"	at 17 wkd on shop floor of an IMI company; Mgr by age 26; been on many courses related to management	Y - "well, of course"	Pro - "you could not survive without it"
2	Manager	40	M	Y - partner + one dependant	"Abysmal"; secondary modern (O Levels)	5 year electrician's apprenticeship	"I have become less of a risk-taker as the years have progressed"	Con - "in general, no, not that useful"
3*	Managing Director	60+	M	Y - wife + 3 (all non-dependent)	Degree	apprenticeship at Lucas Industry; then came into family business	N - "he isn't a risk-taker"	Con - "my father hates them *(computers)* - he thinks they're evil"
4*	2 Managing Directors	early 40s	M	Y - married with dependants	Secondary modern	Carpentry & Joinery apprenticeships	Y - "they have been risk-takers ... to set up a business like this"	Pro - "in this type of business they do have a use"
5	Proprietor	40	M	Y - married with dependants	Degree in Languages from Oxford	wkd for petrochemical company; set up own business due to personal circumstances	N	Pro - thinks on-line communications would be useful & interested in remote working
6	Managing Director	32	M	N	Degree in Electronics & MBA	Electronic Design Engineer; Applications Management; Business Development; Technical skills and business interest	Y - "Oh yes, absolutely"	Pro - "What you're doing makes it essential? Absolutely."

Note: *denotes that the interviewee was not a key decision maker, but provided relevant information about the decision-maker(s)

Table 6.2 Personal characteristics of decision-makers *(Part 2 of 4)*

Firm no.	Decision-maker							
	Position	Age	Gender	Dependants	Education	Skills & Experience	Risk-taker?	Attitudes to ICTs
7	Chief Executive	late 50s	M	no information	Left school at 14	Office boy in Fleet St; Financial Journalist by 18; left journalism 1970; went into banking, financing hi-tech cos.; left The City 1989	Y - "calculated risk-takers from a financial point of view"	Pro - reluctantly - "with time I expect even an old dog learns a couple of new tricks!"
	Technical Director	late 50s	M	no information	Technical school; University in London - Technology of Navigation Diploma	Electronics industry since 1963	Y - "very much so"	Pro - "small companies like ours need to get more sophisticated in terms of IT"
8	Managing Director	40s	M	Y - wife + 2 (1 of whom is dependent)	Secondary school	Boat Builder's apprenticeship; owned car mechanic business; does antique restoration	N - "he avoids risks"	no information
9	Managing Director	mid-50s	M	Y - wife	no information	Owned similar companies all in the data communications market	Y - "I'll take any risk in the book"	Pro - obviously, since his firm produces teleprocessors
10	Production Manager	mid-30s	F	N	"very poor" left school at 15 with no qualifications	Ran canteens on building sites; came to work in this company when it was still in London	Y - but "most of the new things we do wouldn't be technology - they'd be on the production side"	Pro - "I think it's gonna be very useful *(referring to EDI)*"

Table 6.2 Personal characteristics of decision-makers *(Part 3 of 4)*

Firm no.	Decision-maker							
	Position	Age	Gender	Dependants	Education	Skills & Experience	Risk-taker?	Attitudes to ICTs
11*	Managing Directors	no info	no info	no information	no information	no information	"There's very little risk-taking at all."	"We couldn't live without it and we can see it's going to grow more and more."
12	IT Manager	34	M	none	left school after O Levels	Workstudy; HNC in Mechanical Engineering & Production Engineering; Computing skills are largely self-taught & through courses	To a large extent, yes, but admits to always liking to minimise the risk.	Pro - has taken the hard graft out of much of the factory-floor work; very useful in this particular business for time and money saving
13	Managing Director	40	M	wife and dependants	Mechanical Engineering degree; MBA.	Engineering VSO; worked for Lucas (production development) & in auto-motive components marketing company; consultancy.	Both risk-takers to some extent, but do not risk their own finance - borrow it instead because of their responsibilities to their families.	Believe technology will be very useful when the business expands. They "will have to follow the Fords and the Lucases."
	Director	45	M	wife and dependants	Mechanical Engineering degree	Product development at Smiths' Industries; previously worked as consultant.		
14	Managing Director	45	M	wife and 2 dependants	No academic qualification. Certificate of Industrial Management.	Always worked for large companies. Learned computing at evening classes.	"Conservative with a little 'c'" - in business calculates and controls the risk.	Likes "state of the art technology" because it works and keeps the business competitive.
15*	General Manager	45	M	married with 4 children (3 are dependent)	American; graduated in the US as an Industrial Chemist	Director of Research and Development Department in the US (here on secondment for 3 years)	"would do a full assessment rather than jumping in"	"in a hi-tech inter-national product, if you're gonna do it in this location, you couldn't do without it"

Note: *denotes that the interviewee was not a key decision-maker, but provided relevant information about the decision-maker(s)

Table 6.2 Personal characteristics of decision-makers *(Part 4 of 4)*

Firm no.	Decision-maker							
	Position	Age	Gender	Dependants	Education	Skills & Experience	Risk-taker?	Attitudes to ICTs
16	Operations Manager	30	M	Co-habits; no dependants	Comprehensive; Technical College; Polytechnic (Industrial Studies degree)	Worked as truck driver and factory worker; no serious career plan; "came upon this job by accident"	Amount of risk he is prepared to take is proportional to the amount of personal responsibility he has.	"It's gonna open more and more doors; it's gonna open the rural communities to an expansion of consciousness ... in terms of business."
17	Director of Finance and IT	45	M	Divorced with one dependant.	Qualified Management Accountant	Always worked in industry (engineering, shipping, publishing); experienced in installing systems.	"Where I think it is necessary."	Will have to use technology more to link with other sites, customers & suppliers.
18	Owner	60	M	Married with three non-dependants.	Civil and Electrical Engineering experience; London University trained as drama teacher	Worked as engineer, then drama teacher then sec. of examining board for drama teachers.	No.	
19	IT Director		M	Married; no dependants.	A Levels; Industrial Management courses; Diploma; currently doing Masters degree in Engineering Business Management	Merchant Navy; joined company in 1970; committed to skills training and education; experienced in installing systems	"Yes ... I'm an activist by nature ... I'm definitely a get in there and do it"	In rural business - "essential".
20	Managing Director	35	M	Married with one dependant.	Economics degree	worked in large company gaining experience in all aspects of business; British Steel (4 years); consultancy; MD of this firm	"I'm conservative - I will put the business to the least amount of risk possible - I took a lot more risks before I had a family and my own home"	These days - v. important "I've got to keep abreast of new developments and the more I can utilise it, the better opportunities we have to move forward"

The personal characteristics of the influential individual(s) in the decision-making process can be demonstrated as being crucial factors in determining whether or not a firm goes down the route of hi-tech ICTs. A firm which has remained very traditional in terms of its communication of information is Firm 3, a manufacturer of road signs and traditional-style aluminium castings. The firm was set up in 1874 and has remained in the same family since that time. The interviewee is the third generation of this family. It should also be noted that this firm's future is uncertain. This has been a regular state of affairs since the current Managing Director came in to close it down thirty years ago. The firm might be termed a 'non-adopter' in terms of advanced ICTs and, although, as has already been shown (in section 6.2), this is partly a result of the overall levels of technology used in the markets within which this firm operates, the characteristics of the entrepreneur are also vitally important in this respect. The interviewee, the Assistant Managing Director, is the son of the current Managing Director who is approaching retirement, but who still controls the firm's finances and procurements.

The Managing Director is a graduate whose first industrial experience was as an apprentice in the aerospace industry. He came into the company thirty years ago in order to close the factory down. However, the business was revitalized by a shift in government policy and he has since remained Managing Director. According to the interviewee, his father runs the company

> "almost with a rod of iron ... his workers all hold him with such reverence and terror."

However, when it comes to taking risks, he avoids them at all costs:

> " ... he isn't a risk-taker. His philosophy is very much that he works to live. He doesn't live to work. ... we've been going for a long time and if he doesn't see that there is a future in something, he sees that there is little use in throwing away everything he's worked for. ... no my father wasn't a risk-taker."

This consolidatory rather than progressive attitude reflects on the way in which decisions are made regarding ICTs and in the level of technological penetration within the firm. The firm's means of communication are still relatively basic, the bulk being by phone. However, the use of fax is increasing rapidly (about 40% of the business now coming in by this medium). The interviewee believes the fax has now become almost indispensable.

> "We live by it ... it's become almost a lifeline. That and the telephone linked up together - they're our main tools of the trade, almost, now. ... Couldn't do without it - they are the most important machines that we've got in the place."

In terms of more advanced IT equipment, the firm also uses PCs and has a CD-rom. However, the CD-rom is not used in the business at all. As the interviewee confesses,

> "The nearest I got to using the CD was I opened it one day to see if the button worked!"

What has happened in this firm is that hi-tech gadgets are bought for one individual, the Technical Director. Some of these are of use in the firm's day-to-day business, but others are not and are bought because the entrepreneur has no working knowledge of advanced ICTs. The entrepreneur's son said on this subject:

> "The CD-rom facility was mostly got, I think, because *the Technical Director* fancied having a CD-rom on the computer. *The Technical Director* likes computers. My father *(who is still the main decision-maker)* hates them - he thinks they're evil. He's never touched one in his entire life - he wouldn't even know where to start. ... But *the Technical Director* likes these things (they're like toys, you know). He can get away with telling my father we need to spend £3000 on a computer rather than £2500. My father will just go 'Oh, yeah - OK then *(in a vague voice)*' because it's a computer, you see, he doesn't understand them."

Clearly, the entrepreneur's lack of knowledge and, indeed, interest in the realms of ICT use in the business have laid open the way for advantage to be taken by one individual. Hence, some questionable choices have been made, not for the good of the company, but to satisfy the whims of one individual. This quote also reveals the unstructured way in which decisions are made within the firm. In the case of ICTs, there is no clear decision-making pathway through which researched choices are filtered through consultation before a final decision is made about procurement. Inevitably, this has led to poor decisions or no decisions at all - in other words, stagnation. In addition, the interviewee, who is currently taking over from his father as Managing Director, does not have any interest in ICTs either. So the situation is unlikely to change in the near future. Speaking of computers, he says:

"I use them where they're necessary. I prefer to use the typewriter where at all possible."

The pervasive attitude within the firm, therefore, seems to be one of apathy when it comes to advanced ICTs. Hence, levels of use remain low. There are no plans to use advanced telematics technologies in any part of the business, unless, in the future, the factory part of the firm had to be shut down. The interviewee explained one possible scenario where there might possibly be a role for such technologies:

"Third scenario - you pack in the business completely and you run almost a consulting firm using your client base using, say, an approved supplier that we know of, of our products that we use. We do all the work on computers, we set it all up, etc. So, effectively, they are having this firm's brand products - they're made by somebody else, somebody whose standards we're happy with. They'd have all your patterns you've got and all the literature and then you'd run an office, effectively, using fax, telephone, a few of the other electronic goodies. Then you might be looking at spending in the electronics. Say I was here and we were using a firm up North ... It would mean reams of paper, massive telephone bills. Then you might start thinking - you'd be looking at computer link-ups."

The situation of Firm 6 represents a contrasting scenario both of ICT requirements and of managerial attitudes. This firm demonstrates the positive effects of having a decision-making team who are very much proponents of hi-tech business solutions and whose background is one of substantial investments of time, energy and knowledge into rapidly expanding and highly successful engineering firms. The management background of this company comprises three individuals (two of whom are brothers) who are very experienced and highly skilled in the aerospace and oil industries. The two brothers are in their sixties, both graduates, one in Aeronautical Engineering and the other in Maths and Physics and, together, hold numerous patents in the area of borehole surveying and drilling. Both have been directors of a major firm in the industry. The third member of the management team, the Managing Director and also the interviewee, is in his early thirties and an Electronics graduate. He has also previously managed a similar company in the industry and has an MBA. He describes his business skills as "quite strongly technical plus a commercial interest".

The Managing Director was taken on board just over a year previously, his aim being to:

> "... remove the dependency of the company on R & D contracts and putting it much more onto a manufacturing basis ... selling a product to make money".

As Managing Director, the interviewee is the most important individual in the decision-making processes within the firm. He has no dependants and when asked whether or not he would consider himself to be a risk-taker, he replied:

> "Oh yes, absolutely. There's a certain challenge with that and it's having the courage of your convictions to come and do it. There was a high risk. I was in a very good position with the previous company and there was opportunity there, but it had got to the point where it no longer inspired me and I wasn't having fun ... here, at least, I have fun. The company grows in the direction I want it to grow and, touch wood, that's worked out very well to date. But, yeah - risk-taking is part of that for me, without a doubt."

The interviewee has very clear plans for the future of the company. When questioned about these he replied:

> "If anything, the day-to-day management of the company is not the thing that really turns me on - it's the longer term aspects. Where is the company going? Where is it going to be in a year, in two, in three, in four? And I've got a very clear strategic intent, strategic plan for this company which we're pretty much working to. That doesn't mean to say that we don't take opportunities as they occur and they clearly do, but very much my intent was to develop an aggressive commercial organization here which was positioned in the market as a leading independent supplier."

Evidently, this firm is in competent hands when it comes to the experience, skills and drive of the management team. The Managing Director shows a progressive attitude towards his employees' abilities and their responsibilities. Decisions are made in a very non-dictatorial manner, all the specialists being given a stake in the proceedings. This can be shown to be having a positive effect on the ICT strategy of the firm. The decision-making process does not follow any particular set procedure, but it does involve everyone concerned with the acquisition in question:

> "... it does tend to be driven out of need, in terms of engineering requirements, in terms of company development, and that tends to be me who makes that call and tries to keep on top of

> needs - and, particularly, what our customers might need as well. ... I wouldn't try to dictate what my software engineers need for their next generation of development. They would come along with a list of what they want and we'd talk through the pros and cons and the cost-benefits and, like any other appraisal, we'd look at it and if it makes sense, we'd buy it. But, generally, from a technological development of the company - sort of infrastructure-type things - that's certainly myself".

In terms of ICTs the firm is not at the cutting edge, but is, nevertheless, very much in the forefront of developments in communications technologies. Advanced telematics services used include EFT, E-mail and EDI. These are all in use because of the need to communicate with companies in the US, but also because of the attitudes held and decisions made by the management. However, these might both be considered to be internal rather than external requirements, because of the fact that it is the management team who want to use this technology in order to cut the turnaround time of communications across the globe. They are not being forced by these other companies, rather they, themselves, wish to adopt such means of communication in order to remain efficient and, hence, competitive.

The general outlook of the Managing Director is crucial to the success of this company. When asked how he envisaged the firm developing in the future, he explained how ICTs will fit into the equation:

> "I think the company will grow to 25 to 30 people over the next two to three years *(currently it employs 15)*. It will become a £5 million company in that time frame as well *(it is currently a £1 million company)*. ... We'll become very manufacturing-focused ... in terms of the infrastructure of the company, that will have to change somewhat. The sort of small firm mentality will have to change a bit - we will develop into a medium-sized organization ... and that will pull in a lot of other information technology requirements in terms of systems and structures and procedures. It's an inevitable part of growth really."

Most importantly, however, and particularly in the light of the behavioural approach adopted in this research, the interviewee is mindful of the strength of the *people* who work in the company, rather than the technology they use, and their vital role in the success of the operation.

> "... we are in a fairly strong position, in terms of success and market penetration. And people work hard, but they know they're working hard for a future ... at the end of the day, because of the

> people we've got here, that's the strength of the company. There's no doubt about it. We've managed to pull some very good people and really the technology's only one aspect of that. It's the manner in which it is used and the network that develops around those people that makes the company ..."

All in all this is a very successful, rapidly expanding company headed by an experienced, progressive and enthusiastic Managing Director. The level of technological penetration here is clearly a consequence of this type of management and the attitudes which prevail within the firm.

It is also apparent, however, that the entrepreneurial characteristics, although very important in driving forward the process of technology uptake, are acting in conjunction with another internal driving force - the need to communicate with related companies which are remotely located. The following section explores the inter-relationship of personal characteristics of decision-makers and the geographic dispersal of sites in influencing the levels of technology uptake within firms.

6.5 The role of internal factors in ICT adoption - geographical dispersal of sites

In some larger firms, which operate as part of a geographically dispersed company or trading group, the uptake of advanced ICTs may be due, not to any external linkages with customers and suppliers, but rather to the need to maintain regular contact with various firms or branch plants within the group - i.e. an internally instigated need. As indicated in the previous section, this internal influence appears to be very much working in conjunction with other internal factors, in particular, the personal characteristics of key decision-makers within the firm. This section examines this symbiotic relationship more closely, using two case study examples of firms which are committed to improving business practices through the use of advanced ICTs where this is appropriate. In both Firm 12 and Firm 19 the importance of the internal structure of the company, coupled with the influence of key individuals in the decision-making process, in the adoption of advanced ICTs is clearly demonstrated.

Firm 12

A major producer of upholstered furniture, this firm has recently become part of a large group of companies which is owned by shareholders. The group is split into two main divisions - the fabrics division and the furniture division. Firm 12 belongs to the furniture division. The headquarters of the group is located some 45 miles away and it is there that the frame parts for the

furniture are produced. From there, they are shipped to the Cotswold site (at which the interview took place) where the frame parts are assembled and the upholstering is carried out. This site also ships the finished product to locations throughout the UK. The interviewee, the IT Manager, provided an indication of the scale of production at the site.

> "We produce in the region of 2500 to 3000 pieces of furniture a week - don't ask me where they all go! And we probably send out in the region of 50 to 60 vehicles each week and they cover all of the UK *(including Northern Ireland and the Isle of Wight)*."

The sheer scale of production at this site necessitates computerized planning and co-ordination at all stages. Coupled with the need to maintain regular, cheap and efficient contact with the group's headquarters, these represent the firm's main information communications requirements and are the main drivers of the ICT strategy currently in place. The IT Manager explained these requirements:

> "... the control and co-ordination between each department is essential and, as far as IT goes, it plays a big part in resolving that issue. ...We have our own internal production control and order entry system, so that when you receive a customer's order it goes straight into our own internal system and that then creates the requirements for each of the individual production sections/centres."

He explained how on-line communications, via an ISDN line, have improved information transfer between sites:

> "... even the sales office, that's also 45 miles away. The communications, again, are essential and they need to know how far is this particular order progressing through the patch room. Now, we need to feed that information back to them and that, again, is where IT plays a big part. We have an internal tracking system where ... every job that goes through the factory has a bar code label attached to it. We scan it at various checkpoints. We know how far a particular order has got at any one time. The sales office, 45 miles away, taps into the order, and up on the screen it says it's now in cutting, it's now in sewing ... it was done by this particular operator to that sort of level."

E-mail is now used extensively, both on-site and between all the various sites within the group. Fax is still the main method of communicating with external customers and suppliers. However, negotiations are ongoing with certain suppliers to communicate

electronically (i.e. via E-mail and EDI). EDI is also used by the firm with a small, but growing, number of customers entering their orders directly onto the system. The possibility of extending EDI use is, as yet, unsure:

> "... certainly, as far as EDI goes, on the order entry - yes, we're doing it. For actually getting it in every retail outlet and getting all - I don't know if we could ever get to that sort of level - maybe, I don't know. It will be interesting to see what happens and to know quite what direction it will take. Plus, generally in industry there's sort of people sitting on the fence. We've all sort of put our toe in the water, tried a few of our big suppliers, but we'll probably sit on the fence for a while to see what develops."

In addition, this firm also uses teleworking and may increase the range of uses in the future, as the IT Manager explained:

> "Where that becomes more useful for us is that people perhaps on maternity leave that after they've finished their maternity leave and they can't quite decide if they want to come back to work or not. ... We haven't got to the stage of doing order entry or anything like that, because the system is so integrated that we couldn't rip out the order entry side and say you go and enter orders at home and then download them in the evening ... That's an area where, if we were to review it, that's the sort of thing we would be looking at."

However, although the basic requirements for ICTs are grounded in the scale of production and the need to be in constant contact with the other firms within the group, the personal characteristics and attitudes of key individuals in the decision-making processes within the firm are essential drivers of the ICT strategy which has been adopted to satisfy these requirements.

The decision-making pathways are clearly structured. Any ICT requirements which arise must be filtered through the interviewee. If a manager has such a requirement, the interviewee acts on a consultancy basis, researching the viable options to fulfil the specified needs. This information is passed back to the manager in question who will then budget for the proposed acquisition. The interviewee then gets the proposed budgets from all the managers - any "capital" items (i.e. those costing over £500) being accompanied by a justification sheet. It is the interviewee's responsibility to go through these proposals and

approve them. If a budget gets his approval it then goes to his direct production manager and the Managing Director who will review it in terms of whether or not the company can afford it. Further to this, any main capital items go to the main board of directors for final approval. The IT Manager is therefore a major filter in the decision-making process, being the first port of call for all the managers in terms of advice on and approval of their ICT requirements. His role is also important because of the fact that it is at the 'grass roots level'. In other words, he is working in the environment in which ICT procurements will have the greatest potential effects. For these reasons, it is important to look more closely at the interviewee's personal characteristics and attitudes towards the use of advanced ICTs in the rural business environment.

The interviewee is in his early thirties with no dependants. He left school after O Levels to work at the firm, originally starting on a "Workstudy programme" which involved day-release college training alongside business experience. He has HNC qualifications in both Mechanical and Production Engineering, but not in any computing or technology-related subject areas. His interest in IT began at school and was developed on a "self-taught by manuals basis" while working in the firm. He has been on numerous courses on computing and business analysis, learning various computer systems and languages. He proclaims himself "very knowledgeable" in ICTs, having been involved in all the systems used on the site since their installation. When it comes to taking risks, he is willing to take them when it is necessary.

> "Do you feel that you are a risk-taker?"
> "You feel it sometimes - you're right - you are a risk-taker, yes. There's sometimes you have to make a decision, but you hope you've done the work beforehand to be sure you make the right decision ... cos if not you can seriously affect your profitability."

He provides an example of the types of risk he has taken in terms of ICT procurements. The cutting machine referred to in the following quotation is very much at the forefront of technology in the industry, using a laser, rather than a knife, to cut fabrics. It has so far reduced the number of people needed to work in the cutting rooms from around 60 to 70 down to only fifteen. Other furniture manufacturers who have visited the factory have been amazed at the speed of the process.

> "... we are running prototype software on a cutting machine that's running 16 hours a day ... and when it was installed we had no - no chance of knowing - no way of knowing if it was really going to do the job for us and it was a risk. You know, if it didn't do the job, to get it all un-installed and get it ripped out would have probably taken the machine out of action for a couple of days, which would have taken me probably two months to pull back production - and that's working Saturdays, probably eight Saturdays at hundreds of pounds a Saturday - it would have cost thousands. Now, it's a risk, but having gone off to France, having seen the machine, given it a full trial, tested it, proved it, I felt confident that we'd minimized the risk. ... we've already seen a 15 to 20% increase in productivity *(this is expected to rise to 50% when 'all the bugs have been ironed out')*, so it was a risk that proved itself. You win some - I'm waiting for the one I lose now!"

This example demonstrates both the risks that the IT Manager is willing to take and the structured manner in which he researches the potential acquisition in order to minimize the risk involved in such investments. It is also clear, however, that the risks which are involved, should the equipment fail to deliver the expected results, are substantial. The IT Manager has been shown to play a key role in the researching and trialing of potential procurements in new ICT equipment and services. His positive and enthusiastic attitudes towards technological business solutions and his willingness to try out new and innovative technologies are instrumental in shaping the present picture of technological penetration within the firm.

Firm 19

This firm belongs to a multinational group of companies which was founded in the US in the 1940s and now has a turnover of over £1 billion a year. The company manufactures compressed air processing equipment, the firm in question belonging to what is called the Fluid Power Group of companies, which "manufacture and supply everything downstream of the compressor up to the hand tool which actually uses compressed air as motive force". The firm at which the interview took place (i.e. the firm situated within the study area) is part of the Airline Division, making

"the filtration, regulation and lubrication which filters the air as it leaves the compressor and up to the power tool. The regulator controls the pressure at which the tool operates and the lubricator lubricates the bearings in the tool."

The product made and the evolution in the way in which it is manufactured are also influential factors in determining the ICT requirements of the operation. CAD (Computer Aided Design) systems have been in use "since the early days" and the design is now done with a view to commonality across all manufacturing sites. Hence, there is much contact between globally dispersed Design Teams.

The company is now UK owned with sites all over the world, including major sites in Germany, the United States, Belgium, Australia, New Zealand and India. The interviewee, the IT Manager, emphasizes the global nature of the company's influence:

"... we have a policy that says, once the turnover in those countries *(meaning any of the countries where the goods manufactured by the company are sold)* gets over £10 million, that we will actually invest in a manufacturing plant in that location. ... but, yes, we do manufacture on virtually every continent."

Effective communications between sites are therefore crucial and this requirement is the main driver of the decision-making behaviour within the firm with respect to ICTs. For instance, EDI is used intensively, primarily for speed of communications to the US. In addition, it is also used by suppliers to communicate with the firm and by the firm to communicate with customers. However, this is a relatively minor use since this firm has much less direct contact with customers than many of the firms surveyed. Customers and suppliers, therefore, are of very little influence in the adoption of ICTs. Videoconferencing is heavily used for communication between all the major manufacturing sites in the group, but particularly between the Design Team based at the site surveyed and its counterpart based in the US. The interviewee was asked about the overall levels of technology penetration within the firm.

"Do you think that you are quite innovative in this industry in this way *(meaning in terms of the levels of technology used in business solutions)*?"

"Yes we are. If you look down the list of tools and techniques that we employ, there aren't many that we don't. ... I can't think of major pieces of technology which we don't utilize to some extent, or don't plan to. And if something new comes along we will almost certainly investigate it and find out its usefulness and go for it - if it's got a benefit. ... I really can't think of an area where technological change hasn't impacted on the way we do things over the last ten years, and continues to impact on it."

There are various communications problems which arise due to the dispersed nature of operations. For instance, the fact that many of the companies within the group have come from different backgrounds (prior to acquisition by the group), some having only recently been taken into its ownership, means that they use different communications systems. For example, the E-mail systems used in the US are different to those used in the UK sites. Although this does not mean communication between the two systems is impossible, it does mean that the interface between them is noticeable.

The decision-making behaviour within the firm is also instrumental in producing the relatively high levels of uptake of advanced ICTs which are apparent in this firm. This is due to both the way in which decisions are made (i.e. the pathways through which choices are filtered before the final decision is made) and the personal characteristics of the key decision-makers. When questioned about how the decision-making processes of the firm work, where the acquisition of hi-tech equipment and services are concerned, the IT Manager confirmed the importance of his role in the chain of events:

"Well, I have to say, it's pretty much down to me, or has been in the past. ... I don't have the final sanctioning or authority, but the case that I would put forward would, you know, win or lose the case."

He explained how the decision-making process works:

"I suppose the first thing you have to do really is identify the need and find out who can actually supply that need ... and it's never down to one - I always like to have two or three parties involved in this so we can properly evaluate what they're offering. I also have a reference site so I can refer to somebody who's actually been sold the solution before and can say whether it's good or bad. There nearly always has to be some financial justification - and that's not always easy with a new piece of technology. I mean, a lot of these things ... there isn't necessarily a visible payback in the

> short term. ... When all this is being done you use a standard formula for what the internal rate of return is likely to be, produce a written paper, which is the capital justification for it, and it comes to me and I'll either sign it and approve it or it'll go back for revision ... and then it will go to the board *(the Board of Directors)* ... and if it goes to the board with my recommendation on it - I've actually not had one turned down yet."

Clearly, there is a very structured approach to such acquisitions and this, in itself, demonstrates the importance attached to this aspect of the business. It also ensures that any acquisition made has been well researched and is thus more likely to constitute a valuable investment in both the short- and long-term. The importance of the interviewee in this decision-making process is also vital in determining its direction and in maintaining its drive. Both his background and his attitudes towards the use of advanced ICTs can be shown to be very positive factors influencing his decision-making behaviour in the business. He is in his fifties and married with no dependants. Having left education after obtaining A Levels to go into the Merchant Navy, he joined the company in 1970. He has had extensive training on several industrial management courses, gaining various certificates and diplomas. He is also committed to providing education and skills training for all, particularly in the area of ICT use, having run many such training courses for employees over the years. He is currently doing a part-time Masters Degree in Engineering Business Management. Within the company, he spent six years away from the site at which the interview took place, implementing the computerized manufacturing system in all the UK sites and in Belgium and Germany. On his return he became IT Manager, but he is keen to stress that this was not due to any particular affinity to such systems:

> "I ... then came back here and put the same system in here and then effectively took over as IT Manager. It's not my forte, IT, actually. I look on IT as just a tool to get the job done. I'm actually a manufacturing man - a Materials Manager - and I think that there's a big danger in looking on the systems as being anything more than the tool to run a business with. I don't get excited about it - I think it's all boring *(laughing heartily)*, but I use it."

Clearly he has a very down-to-earth and functional approach to the use of hi-tech business solutions. However, when questioned specifically about the usefulness of ICTs in the *rural* business environment, he confirms his belief that advanced telematics services are an essential tool for business operating in rural areas.

"What are your personal views on the usefulness of telematics in rural business?"

"In industry you mean?"

"Yes."

"Well, essential. Simply because you are rurally located means that you are less accessible than you are if you're in a major commercial industrial area ... In some ways it's even more important that you can be contacted quickly and easily and cheaply. So, yes, it's essential."

The IT Manager's progressive attitude towards ICTs is coupled with a set of clear goals and objectives and a propensity to take risks where necessary:

"So, would you say that you are a risk-taker? "

"Yeah - I am actually. I'm an activist by nature *(keenly)*. Yes - and I know what my personality traits are. Yes, I'm not a pragmatist or a theorist. I'm definitely a get in there and do it."

From this example, it appears that the most important determining factor in processes of ICT uptake remains the internal structure of the company; in this case, this constitutes the geographical dispersal of sites across the globe. This is the basis upon which the requirements for advanced ICT equipment and services are founded. However, factors which are most influential in actually meeting these requirements and making acquisition decisions are those pertaining to the way in which such decisions are made and the personal goals, attitudes and characteristics of those who are key actors within the decision-making process.

6.6 Decision-makers, rural businesses and the rural development impacts of ICTs

Having examined the influencing factors in the ICT adoption decision-making process and the nature of the causal links between them, it is appropriate to examine the outcomes of this process from the point of view of those upon whom it depends - i.e. the decision-makers within rural firms.

6.6.1 Decision-makers' perspectives on rural development

From the in-depth discussion of the debate surrounding academic perspectives on the concept of 'rural development' (see section 2.3), it is clear that there is little consensus among writers regarding the meaning of the term. Similarly, entrepreneurs interviewed in the manufacturing and engineering sectors expressed a wide range of opinions in relation to what they believed

'rural development' to constitute. For instance, the Resources Executive interviewed in Firm 15 (an international filter paper manufacturer) commented on his understanding of the term 'rural development':

> "I see it as providing some kind of opportunity for people to live and make a living in a rural setting ... and developing that against the competition and the 'suction', if you like, of industry to the urban conglomerations. ... Telecommunications can help in that respect; you are able to communicate from a rural setting and compete with people who are not."

The Managing Director of Firm 14 (a Warwickshire manufacturer of polymer products, moulds and resins) believes that rural development involves:

> "in its broadest term ... it's ... from housing to factories to everything else".

An IT Manager interviewed expressed his conceptualization of rural development in terms of the decline in agriculture and the associated need for more diversification of rural economies:

> "a way of attracting business and trade and whatever to the country, as far as I can see. The business of rural areas now, running farms, large or small, is done with very few people and without it *(rural development)* there's not employment for people in the area and they don't want to leave."

More complex and socially concerned perceptions of 'rural development' were also expressed. For instance, the Operations Manager of Firm 16, which assembles, packs and distributes automotive components, admitted that his perception of 'rural development' had been moulded by the discussion during the interview:

> "Rural development, prior to today, I would have discussed, I don't know, housing projects and social development, as opposed to business development, but now - sitting and talking about it - rural development is expanding the consciousness of the people that actually live here. That's as important as new building. ... but I don't think people realize that they're developing - they're just being moved along."

The perceived and actual rural development impacts on local communities of the business use of ICTs have thus been observed and illustrated, both in the theories put forward in the literature and from the perspectives of the entrepreneurs/interviewees themselves. Their own conceptualizations of rural development provide a context for their views on how the impacts of ICT use in rural communities might have further implications for rural development. These conceptualizations are crucial to gaining an insight into the cognition of respective interviewees regarding the real rural development impacts which ICT use might have, because their views on the concept vary widely. They range from more simple ideas about introducing new industry and housing into rural areas, to more complex issues such as the expansion of the social consciousness of individuals living in rural communities. Later, in Chapter 7, the views expressed by interviewees from various economic development agencies, regarding the effects which they believe the business use of ICTs in rural areas will have on rural development, are considered in order to provide a more holistic picture of the possible rural development implications of ICT penetration in rural businesses.

6.6.2 Decision-makers' perspectives on the use of ICTs in local development strategies

Clearly, through their day-to-day operations, many firms exert an influence, be it beneficial or detrimental, over the rural communities in which they are located. It might therefore be expected that the potential rural development effects of the use of ICTs in a rural firm would depend to a high degree on the level of integration of that firm within the local community, both economically and socially. Before examining the role and potential of external agencies working in the rural economy (the focus of Chapter 7), it is necessary to review the range of possible impacts which might be felt at the level of individual firms and local communities. Examples from firms in the study area will be used to illustrate these impacts.

Technology use in firms which are more wholly integrated within a rural community would be much more likely to affect that community in a number of ways. Firstly, firms employing a high proportion of local people might facilitate technology transfer into the local population through its use within the firm itself. This may only be to the extent that a growing awareness of the possible applications of ICTs is fostered in the population; however, this can be a significant progression in some rural areas which, traditionally, have been less exposed to new technologies. More importantly, though, the use of ICTs by members of the local community, while employed

in rural firms, raises the levels of transferable skills within that community. Individuals involved may be more employable in a broader range of situations and this should heighten the sustainability of the economy as a whole, as its skills base becomes more diversified, away from those skills traditionally seen as prevalent in rural areas. An example of these positive effects which can be gained through the use of ICTs in a rural firm is illustrated by Firm 15 which is part of an international company and employs a high proportion of local people. In terms of the direct effects of ICTs on rural development in the local area, the Resources Executive referred to the up-skilling of the local workforce, particularly those in older age groups:

> "I don't think that industry, or enterprises of this sort, would exist here now if you couldn't do that. I think it's beneficial. It has issues like training people to use it - there's still a fear of new technology and it's maybe even higher in a rural setting than elsewhere. People are less exposed to it ... it's still a bit - what's the word? - backward, maybe, in terms of the pace of life. So you recruit someone from the local area - they're a bit less inclined, maybe. I think it's changing with younger people ... the schools are doing it now and it's no big deal ... it's second nature to them, people of that sort of age group."

However, this introduction of new skills could prove to be detrimental to the rural community if individuals are subsequently empowered/enabled, through up-skilling, to move away for the purposes of employment. This already occurs in rural areas where there is insufficient employment for skilled and professional people. The social and demographic nature of the community may be seriously affected as school leavers and young families leave the area. This, in turn, leads to a shortage of certain sections of the population and to declining communities as the demand for rural services falls below viable levels and the availability of individuals to provide such services declines.

Secondly, the business use of ICTs, if applied correctly, can promote greater efficiency. This can be economically beneficial to the firm itself and to the community as a whole, if it improves production methods and increases output, thus leading to increased profitability of the firm. However, the knock-on effects of increased efficiency due to the introduction of ICTs can be detrimental if they lead to job losses. There has been a gradual replacement of the labour force by advances in technology and machinery in many industrial sectors; manufacturing and engineering are no exception. Indeed, many people's fears of technology are, at least partly,

fuelled by this knowledge. The IT Manager of Firm 19, however, believes that, although technology has replaced people, this can be done in such a way that redundancies are not necessary.

> "And do you think that there have been any ill effects on the local community because you're using this technology?
> Eh ... *(pause)*
> I mean, for instance, adverse effects such as job losses due to increased use of technology, etc.
> No, I mean we don't have a ... we have a policy of zero redundancies. ... I think if you plan your business strategy reasonably well enough ahead, then you can cope with downturns in the use of labour and cope with it in natural wastage and people retiring. ... No, I think, properly managed, properly planned, there shouldn't be a need for redundancies. Natural wastage will cope with technology replacing people, which it undoubtedly has. There was a computer department here with its local processor and when it was all card readers and tape drives and - I forget how many people were employed actually - ten I suppose, and now I have three. And no card readers either!! *(laughs)*"

Thirdly, the adoption of advanced ICTs in a rural firm can improve its accessibility to both suppliers of raw materials and to potential customers. This can raise the firm's (and indeed the community's) profile, both nationally and internationally, attracting investment into the area. ICTs allow firms to be located almost anywhere and this often has benefits for rural communities. New industries are now setting up and providing employment where previously they could not have done due to the barriers created by distance and the associated communication constraints. Such barriers and constraints are now being broken down due to the 'distance-shrinking' effects of new advances in ICTs (Gillespie, 1987; Grimes, 1992; Hudson & Parker, 1990; Ilbery *et al.*, 1995).

The Operations Manager of Firm 16 (an automotive component assembler) indicated that the use of ICTs had not only allowed the firm to remain in business, but had also encouraged the workforce to "get out of this mindset of small-mindedness", which in itself, he believed, was a form of social development within rural communities. On the subject of whether or not the firm's use of ICTs was making a contribution to the process of rural development, he referred to the ability of new technologies to allow firms to locate virtually anywhere:

> "Yes definitely. Because we can see the benefits of being in a rural area ... a reasonable labour pool, you might have to sift through it, but we can see that you can bring business into an area like this and if you start to affect ten people out there *(i.e. outside his office - on the shop floor)* that might affect another twenty people outside, which brings ... the feeling of isolation is diminished."

Finally, rural economies can be strengthened internally and their self-sustainability enhanced if firms in related industries within the local area are able to utilize the networking capabilities of ICTs to communicate with each other. Intra-area linkages forged in this way can be beneficial in making an area more competitive in national and international markets.

However, a number of the firms in the area have been shown to be involved in little, if any, interaction with either the communities within which they are located or with other businesses in the local area. In such firms, the use of advanced ICTs is unlikely to have any beneficial knock-on effects for the local community. Conversely, it is possible that local people could be further excluded from becoming employed by the firm due to a mis-match between the local skills base and the advanced nature of procedures and methods followed as a result of technology use within the firm. This is most likely to happen where a firm is an incomer attached to a large multinational company and having only linkages with businesses and organizations outside the local rural area, or when its product is highly advanced requiring very specialized skills of the sort normally imported from areas outside the local rural sphere.

There is also further debate surrounding the potential social impacts of the use of ICTs in rural areas, which centres on the in-migration of people into rural areas to work from home in a peaceful setting. This is usually related to the implementation of teleworking which remains outside the scope of this particular research, but may also be related to the influx of such businesses as software houses into rural communities, something very much within the scope of the research. On the one hand, this might have the effect of reducing the demand for local service provision because of the use of rural towns and villages as no more than dormitory locations. However, it may also have the negative effects of attracting high income earners to the countryside, thus maintaining inflated house prices (first initiated by the commuter boom and the trend in second home ownership in the 1980s) and preventing the retention of the indigenous younger generation who can no longer afford to buy homes in the area. Concerns over these potential impacts were raised by several interviewees in relation to the possible implications of

technology use on the vitality and sustainability of rural communities and, in particular, on the indigenous elements thereof. This concern is clearly illustrated by the opinions of one interviewee. When asked if he thought the increased use of ICTs in his firm could affect the social and economic well-being of the rural community, the Managing Director of Firm 14 (a polymer product manufacturer employing 22 people) suggested that the social implications of technology use in general could be problematic:

> "Not this - I don't think this one ... no I see telecommunications as affecting rural development in a different way. I think it will lead to the migration of a lot of people who work in offices and possibly in factories, but more so on the commercial side and technical side of businesses, moving out and teleworking. That's where I see that all these computers and ISDN lines and everything else. I think it won't necessarily lead to the people in rural areas gaining that expertise and using it, unfortunately. I see it as being the people who come from ... Coventry University *(laughs)* etc. moving out to the 'idyllic', in inverted commas again, rural areas and working from there. And a lot of these people I don't see as necessarily being of benefit to the rural area because they won't engage in social intercourse, for want of a better word, in the area.
>
> So do you feel that it might have a 'breaking-down' effect on the social make-up of the community?
>
> I think it's already happened - I think that's happened with people who commute, who come to live in rural areas. So there are two types of people who live in this village, there are two types of people who live in most villages: those that were part of the indigenous population of the area originally - the rural people - and the people who have moved there. And they don't necessarily mix - not that well. Teleworking is only an extension, in my opinion, ... or the electronic revolution, will only be an extension of that. In some ways these guys won't commute so much, they will actually work, so it could be of benefit. *(sighs)* I think - I, like anybody else, have no idea, I think it could, instead of getting these people who are commuting - they won't."

Overall, although some mixed opinions do exist, the majority of rural entrepreneurs appear to perceive the introduction of ICTs into business processes as something which can bring benefits to firms, to the communities in which they operate and to the general economy of the local area. Although the potential problems of ICT adoption, such as inappropriateness, are recognized, most believe that, managed correctly, the use of ICTs is inextricably linked with prosperity.

Having reviewed entrepreneurs' perceptions of the potential impacts of ICT use in rural areas on local communities and economies, and having found the prevailing attitude in the study area to

be positive, it is pertinent to investigate how this is complemented, or otherwise, by the attitudes and actions of agencies who assume a certain responsibility for these firms. The following chapter will examine the roles played by external agencies in the study area, to comparatively review perceptions of the role of ICTs in the economy from the agency perspective, and to assess the extent to which these views are matched by the practical approaches to ICT use in rural firms which have been adopted by these agencies. In this way it will be possible to evaluate current strategies on ICTs, if indeed they exist, and to put forward informed recommendations as to how agency approaches might be profitably modified in future revisions.

6.6.3 Key determinants of ICT adoption

Consistent with the adoption of a humanistic perspective, a qualitative methodology was employed in this research. Accordingly, no *a priori* generalizations were made regarding the levels of technology penetration within firms or the reasons behind these. However, the analysis of the qualitative data has revealed certain patterns, relationships and trends amongst the firms surveyed. A number of categories of firms, in terms of the extent of their technology use and the major influences affecting this part of their business strategy, were identified. In turn, these findings have far-reaching implications for policy and policy-makers. Four main determinants of technology adoption were revealed.

Firstly, the importance of customer and supplier linkages, having been identified in the quantitative stage of the research (documented in Chapter 5), was further examined through qualitative methods and found to be of significant influence in the processes by which some firms adopt new technological equipment and services. The extent of this influence varies among firms. However, a group of firms are conspicuous by the ways in which several of their large customers have effectively forced them to invest in new ICTs. This has been clearly demonstrated in four of the firms.

Secondly, the type of product manufactured by the firm also appears to be influential in determining the level of uptake of ICTs. This has been shown to be linked to the higher technology requirements of the manufacturing processes of some products compared with others. For instance, firms supplying precision engineered components to the automotive industry are

fairly technology-intensive in comparison to those in more traditional, rural craft-type production such as joinery.

Thirdly, among those businesses which operate from a number of geographically dispersed sites, the need to be able to contact remote sites on a regular and cost-effective basis has been a major influencing factor in the process of ICT adoption. These firms' information technology, telecommunications and telematics investments are a direct function of the level and extent of such communications requirements. This was clearly evident among those firms surveyed which are effectively operating as branch plants of large multi-site, often multi-national, companies.

Finally, entrepreneurial characteristics, key features of the theoretical framework proposed for the process of technology uptake, were, indeed, found to be crucial determinants of this process in a substantial proportion of firms. In particular, characteristics such as attitudes towards the use of advanced ICTs in rural business, personal motivations and business goals, educational and skills background and the propensity to take risks, all play a critical role in determining the types of solutions sought in order to satisfy specific requirements of the firm. Indeed, they also shape the ways in which these solutions are sought. Entrepreneurs who have clearly defined business goals, are educated to degree level and beyond, as well as those who are self-taught in technology, those who are willing to take risks (albeit often calculated and well-researched risks) and those who are keen proponents of the advantages of using such technologies in the rural business environment are likely to influence technology investment choices in such a way as to ensure that ICTs are viewed as appropriate business solutions and are thus employed. Linked to this and also important are the pathways by which such decisions are made - the nature of decision-making, whether structured, defined, rigorously researched or methodical. Standardized procedures for the acquisition of new technologies appear to produce the most appropriate and hence beneficial uses of ICTs.

In recognizing these relationships between the characteristics of firms and the key actors within them, it is important to note, however, that the qualitative analysis is necessarily somewhat biased towards those firms which are more technology intensive. This is due to the fact that the reasons for uptake of technologies and the subsequent outcomes of this process (including its potential impacts on the rural economy and rural development) can only be examined fully in

those firms already investing in ICTs to at least some degree. The question might be asked whether it is possible that many firms who have not survived to be included in the survey may not have done so due to a resistance to new technologies. Certainly, those firms surveyed who were facing a troubled future had displayed such a resistance. It is questionable to what extent this lack of innovation has played a role in bringing about a state of instability. Of course, ICTs must not be seen as the solution to all the problems of rural businesses and certainly do not represent a panacea for rural ills. Evidence for this lies in the fact that other firms survive and prosper despite a resistance to technology simply because they manufacture the types of products which render them traditional and enable them to operate in exclusively local markets. This begs the question of whether this is a result of their role and function as part of the truly self-sustaining and self-contained rural economy of the past. Certainly, it is clear that it is many of those firms producing 'new' (as opposed to 'traditional rural') goods which are technology intensive, thus reinforcing the links between product type and level of technology penetration.

Two important issues are inextricably embedded within this observation:

1. It is often the incomer firms which are manufacturing more sophisticated and technology-intensive products and thus using more advanced ICTs in production and business processes. Their strong links with economies external to the local rural area and their high proportion of non-local labour both serve to lessen the possible benefits they bring to the local rural economy and community. This has obvious implications for rural development impacts and places a question mark over whether or not development agencies should encourage and foster inward investment, let alone whether agency intervention through ICT strategies should be recommended.

2. The noticeable bias towards larger firms in this stage of the research serves to demonstrate the bias which prevails in the rural economy, in terms of which firms have adopted ICTs. This, in itself, raises two further issues: why are these larger firms so preponderant in the rural area surveyed and why are they so prevalent in this particular study?

Larger firms are located in the area for a number of reasons, including accessibility (both in transport and communications terms), centrality of location within the UK, proximity to the

industrial heartland of the Midlands, proximity to London, the south and mainland Europe, and the availability of pools of appropriately skilled labour as a result of the aeronautical and automotive industries located there. This research, in seeking to understand ICT adoption processes and related rural development impacts, must examine, primarily, those firms which are currently using ICTs. The fact that larger firms are at the forefront of this process (due to their communications requirements and their ability to invest staff and financial resources in ICTs) means that they are over-represented in the qualitative stage of the research.

6.7 Chapter summary

The factors influencing ICT uptake and use in rural engineering and manufacturing firms may be summarized as follows:

1. The effect of the supply-chain mechanism is an overriding driver of technology uptake in firms which are locked into relationships with large customers.

2. Product type is also linked to the uptake of ICTs - some products inherently require a higher technology input than others.

3. In firms operating as part of a dispersed group, investment in ICTs is directly proportionate to the level of inter-site communication they require.

4. Entrepreneurs are key in determining the types of solutions sought - those who are self-taught in ICTs, risk-takers and with clear aims are more likely to adopt ICTs.

5. Clearly structured decision-making processes encourage greater incorporation of ICTs into the business.

These findings have important implications for rural development and rural policy, particularly with respect to the promotion of the use of ICTs in rural businesses. The research has defined a particular conceptualization of the rural economy as one in which levels of technology penetration are diverse and are regulated predominantly by the type of product manufactured by firms, the external linkages which they have with their customers and suppliers, the pseudo-

internal links which they must maintain with other geographically remote sites and the personal characteristics of key individuals within the decision-making environment. Furthermore, each firm is unique in the ways in which these factors interact within its confines to produce an individual 'technological profile'.

Clearly, this diversity means that a blanket approach to policy is inappropriate; different types of firms require support packages which are specifically tailored to their individual needs. In addition, a substantial number of firms are already well-advanced in terms of their technology use. Such firms, it appears, have reached this stage without the help or advice of agencies or policy makers and it would be inappropriate to suggest that they might now benefit from intervention. However, for those few firms who are continually operating at the brink of viability and find themselves constantly under the threat of going out of business, advice and policy intervention, of which there seems to be little evidence in the study area, are required if such firms are to survive in an ever technologically advancing and globalizing market. Issues surrounding the role of external advisory agencies and institutions promoting rural development in the study area are the subject of the following chapter.

Chapter 7

EXTERNAL AGENCIES, RURAL BUSINESSES AND INFORMATION AND COMMUNICATIONS TECHNOLOGIES: PERCEPTIONS AND SUPPORT

7.1 Introduction

The previous chapter explored the adoption of ICTs among rural businesses and attempted to account for the patterns of ICT uptake revealed in the quantitative research stage. It suggested four factors which determined technology uptake. First, levels of adoption are higher among firms whose customers and suppliers are other businesses or organizations as opposed to the general public and who are more numerous and geographically dispersed. Secondly, firms manufacturing hi-tech and sophisticated products are more technology-intensive than those in more traditional craft-related industries. Thirdly, firms operating as part of a geographically dispersed, multi-site business make greater use of ICTs. Finally, entrepreneurial characteristics influence the decision-making process involved in the search for business solutions. Moreover, they are influential in determining the type of solutions which are sought. Findings suggest that firms are more likely to adopt ICTs, if under the control of entrepreneurs with qualifications to degree level or higher, or who are self-taught in technology, those who are willing to take risks and those who rigorously research their available options.

The research has pointed to the existence of a two-tiered rural economy based on the geographical orientation of firms. One component consists of inward-looking firms with local customers and suppliers who make limited use of ICTs. Firms in this tier typically manufacture more basic goods and are often closely related to traditional rural crafts (for example, basic wood turning and engineering). Most use straightforward telephone communications, while a small proportion have fax machines. The other tier consists of firms which may be described as outward-looking, in terms of customer and supplier networks. Some operate as part of international groups of companies. Outward-looking firms tend to be those manufacturing more sophisticated products such as precision engineered instruments and complex automotive components. These firms are more technology-intensive, most having computerized a proportion of the business and some

employing the whole range of advanced ICTs, including telematics equipment and services, such as Electronic Funds Transfer, E-mail and videoconferencing. Many are locked into arrangements with very large customers and this is a major reason why they have become technology intensive in terms of both their production and information systems and their means of communication of that information.

Against this background, it is the purpose of this chapter to assess the implications of this ICT use for rural development policy. Important considerations relate to how those agencies promoting rural development see the rural economy and what emphasis they place upon ICTs as an instrument of rural development. The conceptual framework proposed that, among the many factors influencing ICT uptake in rural businesses, the effects of processes operating in the environment external to the firm itself are important. The external environment within which firms operate consists of a range of constraining and enabling factors. These factors were identified as including institutions (agencies, organizations and government), ICT suppliers and macro-scale factors (economic and political climate, and capitalism). Given the limited scope of this research, it concentrates on those factors which the author proposes most directly influence the decision-making processes within rural firms. These are specifically the external agencies responsible for providing information, advice and support directly to businesses operating in the rural study area. The conceptual framework recognizes that these agencies operate at the national, regional and local level.

This chapter is based upon the analysis of information obtained in interviews with agencies working in the study area. The role played in the rural economy by external agencies and their views regarding the impacts of ICT use on rural development are assessed in the light of the findings of this research concerning the model of the two-tiered rural economy revealed. Following an overview of agency activities, this chapter examines their perceptions of, and approaches to, the use of ICTs in rural businesses, within the context of potential rural development implications.

7.2 The role of external agencies in the study area

The concept of rural development has been examined from the perspective of researchers (see section 2.3) and of entrepreneurs in the business community studied (see section 6.6.1). It is the purpose of this section, first, to assess whether or not a 'rural development policy' actually exists in practice among locally influential and relevant external agencies and, second, to evaluate the role of ICTs within the overall development objectives of these agencies. Empirical evidence suggests that, in fact, there is no overall coherent 'rural development policy' which is applied to the area. Instead, despite the increasing formation of partnerships between advisory and support bodies, the agencies and organizations in question all work to different sets of goals, tackling specific areas of policy in an, as yet, relatively uncoordinated manner. In fact, none of the approached agencies either set out or worked to a *rural* development policy *per se*, instead applying policy more generally to businesses, regardless of location. This section identifies the types of agency active in the study area, examining their perceptions of the rural economy and its development in the light of the two-tiered model identified through the course of this research. Agencies' key policy objectives and their perceptions of the role of ICTs in rural development are reviewed in the context of the implications for an overall rural development policy.

Since the 1980s, the government has viewed the SME sector as the engine of economic growth and a primary creator of employment. Consequently, on a national scale, the provision of advice and support for businesses is now substantial and the variety of grants and loans available is extensive. In recent years, the number and range of agencies working with SMEs, in particular, have expanded considerably, as support and advisory services have increasingly been promoted in government measures to improve employment opportunities (Haughton, 1993). Recent years have also seen marked changes in how support and advisory agencies have been organized as a result of government measures. A wide range of sources of business support exist and it is the purpose of this section to present an overview of the range of agencies working in the rural environment and, in particular, to provide details of those working towards rural development in the study area.

Agencies active in the study area may be categorized in terms of the main source of their funding (i.e. governmental, non-governmental or quasi-governmental) and the geographical scope of their operations (i.e. national, regional or local). Table 7.1 lists these various agencies.

Table 7.1 Agencies and organizations active in promoting rural communities and economic development in the study area

Name of agency/organization	Location (of headquarters)
NATIONAL LEVEL	
Action with Communities in Rural England (ACRE)	Cirencester
Countryside Commission (CC)	Cheltenham
National Rural Enterprise Centre (NREC)	Stoneleigh nr. Coventry
Rural Development Commission (RDC)	London & Salisbury
Telecottage Association (TCA)	Nailsworth nr. Stroud
REGIONAL/SUB-REGIONAL LEVEL	
Coventry and Warwickshire TEC	Coventry
Gloucester TEC	Shurdington, Cheltenham
Heart of England TEC	Abingdon
Coventry & Warwickshire Partnerships (CWP)	Coventry
COUNTY LEVEL	
Gloucestershire County Council	Gloucester
Oxfordshire County Council	Oxford
Warwickshire County Council	Warwick
Warwickshire Rural Community Council	Warwick
WREN (Warwickshire Rural Enterprise Network)	Stoneleigh nr. Coventry
Business Link Gloucestershire	Shurdington, Cheltenham
Business Link Coventry & Warwickshire	Coventry
TBAC (Thames Business Advice Centre)	Oxford
Coventry & Warwickshire Chamber of Commerce	Coventry
SUB-COUNTY & DISTRICT LEVEL	
NORBIS (North Oxfordshire Business Venture Ltd)	Banbury
Cherwell District Council	Bodicote, Banbury
Cotswold District Council	Cirencester
Stratford-on-Avon District Council	Stratford-upon-Avon
Warwick District Council	Warwick
West Oxfordshire District Council	Witney
LOCAL LEVEL	
ACE (Computer Training Centre)	Chipping Norton
Cotswold Edge Employment Programme	Shipton Oliffe nr. Cheltenham
Burford Chamber of Trade	Burford
Cheltenham Chamber of Commerce	Cheltenham
Chipping Norton Chamber of Trade	Chipping Norton
Oxford Chamber of Commerce	Oxford
Witney Chamber of Trade & Commerce	Witney

At the national scale, the most notable agencies working to improve conditions in rural areas are the Rural Development Commission, the Countryside Commission and ACRE (Action for Communities in Rural England). The role of business advice and support within the remit of these agencies varies considerably.

At the regional and local scales, the population of external agencies working with businesses is composed of local government (both County and District Councils), government funded agencies, such as the Training and Enterprise Councils (TECs) and Business Links, independent enterprise agencies and training centres. There are also various partnership organizations, usually comprising several of the aforementioned agency types. Local government bodies are organized at county and district level, TECs are usually allocated by sub-region, Business Links by county and independent enterprise agencies and training centres generally operate at an essentially local level. Other agencies which operate on a national scale, but which play a more specific role in the provision of advice and support which relates to the use of ICTs, include the Telecottage Association.

Interviews were conducted in ten locally situated agencies considered to be of most relevance in supporting local firms and concerned most specifically with promoting *businesses* and *economic development*. Both factual material and information pertaining to views and attitudes were obtained during these interviews. Key individuals, whose work involves direct contact with local businesses, were interviewed to ascertain details about their agency and its operation in the study area. Those agencies in which interviews were conducted are listed in Table 7.2 along with the position of the respective interviewees.

Table 7.2 Agencies and organizations interviewed

Agencies and organizations interviewed	Position of interviewee(s)
Coventry and Warwickshire TEC	Research Manager
Business Link Gloucestershire	Senior Business Adviser
Thames Business Advice Centre (TBAC)	Director/Chief Executive
The Computer Training Centre, Chipping Norton	Head of Community Education & Computer Centre Manager
Warwickshire Rural Enterprise Network (WREN)	Manager
North Oxfordshire Business Venture Limited (NORBIS)	Executive Director
Heart of England TEC	Economic Research Executive
The Telecottage Association	Executive Director
Business Link Coventry and Warwickshire	Personal Business Adviser (PBA)
Coventry and Warwickshire Partnerships (CWP)	Executive Manager

Details of the information obtained during interviews are provided in section 4.4.2. Table 7.3 summarizes the main characteristics of the approached agencies.

Other agencies were approached, but not interviewed for various reasons. These included local authorities, chambers of trade and commerce and national bodies working in the countryside. Most of these did not deal specifically with rural businesses in terms of advice and support provision, instead referring inquiries for such services to the more specialist agencies interviewed. Most local authorities and national organizations supplied verbal and/or documentary information relating to their role in ongoing local economic development. Information concerning these agencies' overall remit and details as to whether or not they provide any type of support for *rural* businesses within their overall strategy were obtained. Their roles, main objectives and geographical scope are summarized in Table 7.4.

Table 7.3 Agency profiles *(Part 1 of 3)*

Agency	Start-up year	Funding	Number of staff	Mission statement	Primary functions	Geographical area covered	Rural econ dev policy?
Coventry & Warwickshire Training & Enterprise Council	1990	Quasi 90% public funded	120	• "everyone understands the crucial link between education and training and business success • personal development through education and training is regarded as normal and necessary and is the responsibility of individuals as well as employers • enterprise and endeavour are applauded and encouraged • the full potential of everyone in the community is realised"	• "linking education and employment • helping business succeed • skills training maximising opportunities"	Coventry plus the 3 Warwickshire local authority areas: north, south and east.	No separate rural policy.
Business Link Gloucestershire	1994	Quasi 90% public funded	50	"To contribute to Gloucestershire economic growth by helping businesses achieve their full potential through the provision of the best possible independent, coherent support services thus leading to increased turnover and employment."	• "providing business advice and information to all businesses in Gloucestershire • helping any new or existing businesses to grow • designing and delivering specific services to meet particular needs of Gloucestershire businesses"	All Gloucestershire postcode districts.	No separate rural policy. Rurality is inherent in the area covered.
TBAC (Thames Business Advice Centre)	1985	30% from private sponsors; rest from projects; funding from Business Link.	4 f/t 22 p/t (business counsellors)		1. To assist start-up businesses. 2. To provide on-going support to businesses with less than 10 employees: • free counselling services • business training • business club • meet the buyers • directory of members	Oxfordshire (West Oxon, Vale of White Horse, South Oxon, Oxford City)	No explicit rural policy as the county 'is almost entirely rural'; have specialist agricultural counsellor.

Table 7.3 Agency profiles *(Part 2 of 3)*

Agency	Start-up year	Funding	Number of staff	Mission statement	Primary functions	Geographical area covered	Rural econ dev policy?
The Computer Training Centre	1995	90% public funded	1.5 permanent plus 1 f/t equiv. tutor	"The Computer Centre endeavours to be a focal point within the area for the provision of Information Technology services and training to both the local community and to the wider business community."	"The Computer Training Centre in Chipping Norton exists in order to increase the quantity and quality of computer training available in the area, and subsidiary thereto, to provide services to the local community and business using the equipment provided within the centre."	Business courses - N. Oxon Community courses - Chipping Norton and 8 mile radius around.	No - part of govt's policy for local economic develop-ment
WREN (Warwickshire Rural Enterprise Network)	1991	Quasi (inc. RASE, ESF, Cov & Warks TEC, RDC, PO, IBM, Warks CC.	5	• "WREN follows a philosophy of networking in support of the rural economy • locally, WREN seeks to network with existing organizations to expand the range of services available through the centre at Stoneleigh further afield, WREN co-operates with others to improve the services provided to those working in rural areas"	"WREN works to stimulate the rural economy by improving access to: • enterprise training • Information Technology training • a workplace • business advice and support • childcare."	• Business incubation - Warks • Partnership activities - locally & nationally • Consult-ancy - nationally	No, but this is inherent in the mission.
NORBIS (North Oxfordshire Business Venture Limited)	1984	£120,000	2 f/t plus consultants paid hourly	"To help support and develop pre-start businesses, start-up businesses and those up to 18 months old"	Core function is to provide free business counselling.	North Oxfordshire	No - that is the District and County Councils.
Heart of England Training & Enterprise Council	1991	£1 million - vast majority is from central govt	80	"To inspire employers and motivate individuals to seek to achieve success in a globally competitive economy through excellence in training and education."	Youth training and adult training;. Investors in People (IIP); NVQ development; employee development (getting companies to invest in non-work related training). Education team.	All of Oxfordshire except Henley Rural District.	No - regard Oxfordshire as nearly all rural.

Table 7.3 Agency profiles *(Part 3 of 3)*

Agency	Start-up year	Funding	Number of staff	Mission statement	Primary functions	Geographical area covered	Rural econ dev policy?
Telecottage Association	1993	£150,000	1	"To create the right climate for teleworking to be possible. To assist people and rural economies to develop through the use of technologies. (There is a sub-clause about using shared resources.)"	"To provide good information and to network people."	The UK (there are similar orgzns Wales, Scotland & Ireland.	Don't really have policies.
Business Link Coventry & Warwickshire	1995		3 Coventry 4 Stratford 4 Nuneaton 3 Rugby	"To provide support to small and medium industries within Coventry and Warwickshire to allow them to develop and grow."	• "to service the customer (SMEs) • being on the end of a phone is as important as everything else. (being there as a support mechanism can be as much help for independent entrepreneurs - just to know they have someone they can call on who understands)"	Warwick District Council area	No - policy for businesses does not distinguish by location
Coventry & Warwickshire Partnerships	1994	£220,000 Quasi (incs. City & County Councils, TEC, SRB, the 2 local universities. (£5million SRB funding goes through p.a.)	5	"We have to write an economic strategy for Coventry and Warwickshire to encourage our members to work to it and we also have a commitment to the SRB"	• main role co-ordination between lots of different interests in the area • "we get agreement on priorities and the means by which to achieve them (prevents loss of synergy and opportunities for promotion and persuading government of various issues)"	Coventry & Warwickshire	Has econ dev policy - rural is within the whole.

Table 7.4 Other agencies active in the study area *(Part 1 of 3)*

Agency/organization	Role/aims	Main objectives	Area covered
Warwickshire County Council	"The County Council will work in partnership to strive towards a lasting prosperity to which every Warwickshire resident will have the opportunity to contribute and benefit"	• "to promote a high quality and safe physical and social environment • to strengthen transport communications and the industrial and commercial property base • to promote the sub-region as a business investment location • to strengthen and diversify local businesses • to support the development of leisure and business tourism • to foster research and development and technology training • to develop workforce skills and enhance employment potential • to provide support for disadvantaged groups and communities • to secure funding and support from the UK government, Europe and other sources • to develop links with Europe"	Warwickshire County
Cherwell District Council	The aim of the Council's Economic Development Strategy is "to create a climate for sustainable economic growth which will enhance the overall quality of life of all members of the local community".	• "to promote a high quality image for the district • to promote the business opportunities available in North Oxfordshire • to encourage a release of land and premises to provide a range of development opportunities • to encourage investment in the district which will create appropriate job opportunities and work towards full employment • to increase access to employment and skill training • to assist in overcoming skill shortages by the provision of training schemes and participation in collaborative ventures with other organizations • to pursue a partnership approach to economic development working closely with the local business community and other representative bodies • to pursue opportunities for additional resources from the EU, UK government and other agencies • to encourage enterprise by assisting in new firm formation and retention and growth of existing companies • to encourage the development of high value-added, new technology businesses in the district"	Cherwell District
Cotswold District Council	*documentation only pertains to a study of the Cotswold economy - contains no information on the council's role/aims*	*documentation only pertains to a study of the Cotswold economy - does not contain information regarding the council's main objectives*	Cotswold District

Table 7.4 Other agencies active in the study area *(Part 2 of 3)*

Agency/organization	Role/aims	Main objectives	Area covered
Stratford District Council	*documentation only pertains to a study of the Cotswold economy - contains no information on the council's role/aims*	*documentation only pertains to a study of the Cotswold economy - does not contain information regarding the council's main objectives*	Stratford District
ACRE (Action with Communities in Rural England) - "services the 38 county-based Rural Community Councils (RCCs) - independent charities which work directly with village people"	"ACRE is the national Rural Communities Charity which aims: 'to improve the quality of life of communities and disadvantaged people in Rural England, particularly through the support and promotion of its members, England's Rural Community Councils (RCCs)'."	• "National level: ACRE lobbies and campaigns to out rural issues on the agendas of the nation's policy and decision makers • ACRE speaks out on issues of social housing, rural services, village halls, small schools, transport, rural crime, health, community care and the rural economy • campaigning on rural poverty and low pay, unemployment and homelessness in rural areas • manages national projects of rural social housing and economic and environmental grant schemes for community groups."	Rural England
Countryside Commission	"Our aim over the next ten years will be to make sure that the English countryside is protected, and can be used and enjoyed now and in the future."	• "to encourage local pride • to promote sustainable leisure activities in the countryside • to achieve long-term benefits from farms and woodlands • to plan for sustainable development in the countryside • to provide better information about the countryside • to protect and promote the areas of finest landscape • to improve the countryside around towns"	Rural England
West Oxfordshire District Council	"In 1997/98 the council aims to continue to concentrate on what it is best equipped to do, namely the policies, initiatives and activities set out in the Economic Development Plan."		

Table 7.4 Other agencies active in the study area *(Part 3 of 3)*

Agency/organization	Role/aims	Main objectives	Area covered
Rural Development Commission (RDC)	"Advises the Government on economic and social matters that affect people living in the rural areas of England. Prime aim is to stimulate job creation and the provision of essential services in the countryside. The Commission seeks to strengthen the economy in disadvantaged areas, especially by developing small businesses. In all its activities it aims to work for the good of the rural environment."	• "ensure that key issues concerning the economic and social development of rural areas are understood by government, local authorities and other organizations, and taken into account in the formulation and implementation of policy • improve general understanding of the economic and social circumstances of rural England and the needs and opportunities to which they give rise • promote a strategic and co-ordinated approach to the planning, development and management of rural areas • diversify and strengthen the economy in economically disadvantaged rural areas, through the agency of the private sector where possible, especially by the development of small businesses • encourage and facilitate provision of key services and facilities so people & businesses in rural areas have reasonable and affordable access to them • encourage, promote and, where necessary, implement measures to help disadvantaged groups particularly where the disadvantage is increased by rurality or local economic problems • ensure that its activities contribute to maintaining and improving the environment of rural England • provide a high quality service to clients and partners, and be open and responsive in working with them • work economically, effectively and efficiently, improving the Commission's management systems and developing the skills of its staff"	Rural England
National Rural Enterprise Centre (NREC)	"Through projects which put ideas into practice at local level, research consultancy and information transfer, the NREC promotes a living and working countryside, finding new ways of work to help rural communities improve and strengthen local economies."	• established two telecottages which support small businesses, providing advice, training, a workplace and telework opportunities • works in partnership with local communities throughout England, Wales and Europe • carries out "action-research" projects to provide knowledge about critical new issues affecting rural areas and suggestions for action • management of pan-European research projects (many of which are telematics-related) • runs seminars and publishes newsletters, guides and reports	UK and Europe
Chambers of Commerce	"to provide a cohesive voice for local businesses"	"Provide networking opportunities for businesses; look after the interests of local traders; take up issues with local authorities (e.g. roads, security, etc.)."	Local areas

7.3 Agencies' perceptions of the local rural economy and the role of ICTs

In studying the practical approaches of local agencies to ICT use in rural businesses, it is essential, first of all, to gain an insight into perceptions of current local economic conditions, as held by key actors in such agencies. In addition, their views on the extent to which ICTs are already in use within local businesses and the effects which such use is having (and is likely to have) on existing local economic and social conditions are a vital pre-requisite to gaining an insight into the reasons behind current policies and strategies on ICT use in rural businesses. This section describes both the general economic conditions of the study area and current thinking on local levels of ICT penetration, as perceived by the approached agencies. The rural economy, from the point of view of the relevant agencies working within it, is compared with the model of the rural economy which has emerged as a result of this research. It is important to acknowledge any inconsistencies between the views of policy-makers and the picture revealed by independent research, in order that a realistic assessment of current policies can be made. Furthermore, it is important to recognize differing views if plausible recommendations are to be made regarding future policy.

7.3.1 Agencies' perceptions of local economic conditions in the study area

A more detailed overview of economic conditions, including labour market statistics, may be found in section 4.3.1 and in the SWOT analysis tables in Appendix 7.1. Information provided in this section is derived from the perceptions of the agency interviewees. Three main themes are clearly represented in the perceptions of local agencies - relative prosperity, economic diversity with a preponderance of manufacturing and engineering activity, and pockets of persistent deprivation. These are illustrated below.

Prosperity

Firstly, the study area is, on the whole, perceived to be comparatively prosperous. In Warwickshire, agencies comprise a mixture of those acting on behalf of both Coventry and the whole of Warwickshire and those responsible for the rural districts of Warwick and Stratford-on-Avon in South Warwickshire. The specific agencies

concerned include Coventry and Warwickshire TEC, Business Link Coventry and Warwickshire, Warwickshire Rural Enterprise Network (WREN), Coventry and Warwickshire Partnerships (CWP), Stratford-on-Avon District Council, Warwick District Council, Warwickshire Rural Community Council and the Chamber of Commerce for Coventry and Warwickshire. Among these agencies, the perception of the local rural economy varies, both in terms of the perceived mix of industries located there and in terms of the views of interviewees and agencies regarding the appropriateness and potential of such economic diversity. Common to all agencies, however, is the view that Warwick and Stratford-on-Avon Districts in the south of the county are the more prosperous.

Further south in Oxfordshire, the study area takes in the north and west of the county, in the districts of Cherwell and West Oxfordshire. The agencies contacted in the county include TBAC, NORBIS, Heart of England TEC (HOETEC), Oxford County Council, Cherwell District Council, West Oxfordshire District Council and Business Link (Heart of England). As in Warwickshire, there is a strong belief in the formation of partnerships between various bodies working towards economic development in the county, with HOETEC and Oxfordshire County Council jointly publishing the local strategy for Economic Development in 1995 for the first time. All agree that Oxfordshire's economic indicators show the county to be comparatively prosperous.

> "Unemployment is only around 3.7 or 3.8% and other indicators such as small business survival rates, new jobs into the area and the increase in job availability all show Oxfordshire to have a very healthy economy"
>
> (Agency Interview 7, p.4).

The published unemployment figure for Oxfordshire is, in fact, 5.4% (NOMIS, 1995. In HOETEC, 1995, Labour Market Summary, Table 2.2.).

Oxfordshire's relative prosperity was emphasized by the director of Agency 3 who summed up his perception of the county's economy, the feelings of its entrepreneurs and the potential problems for attracting inward investment to an area with such low levels of unemployment.

> "There is a fairly heavy service sector. For a lot of the small businesses it's much more about quality of life than being the next Richard Branson or Anita Roddick. The biggest change in the economy has been that there is no longer any such thing as a job for life and businesses are moving faster and faster and wanting to change their workforces more and more frequently. There is pressure within those companies and it is increasing. People are wanting out - out of the rat race. They want to take control over their own lives and futures. Oxfordshire also has very low unemployment - this is a problem for new larger companies coming in since they often want to come into the area, but cannot find a workforce to employ - this is something which *this agency* tries to 'match'."
>
> (Agency Interview 3, p.5-6)

Agencies working in Gloucestershire include Business Link (Gloucestershire) Limited, Gloucester Development Agency (GDA), the Chamber of Commerce and Industry (GCCI), the County Council, the Training and Enterprise Council (GlosTEC) and the various District Councils. As in Warwickshire and Oxfordshire, these agencies have joined in collaboration with various interested private organizations to form a partnership body with the aim of implementing a coherent economic strategy to 'generate prosperity' within the county.

Gloucestershire is perceived by the partnership to be a county with a broad industrial structure, but which has an over-representation of manufacturing sector industry. However, Cotswold District, the part of Gloucestershire with which this research is concerned, has below the national average percentage of employees in manufacturing. The county has a long tradition of aerospace and defence industry production which has built up a skilled labour force. However, this is also seen as a potential weakness as the defence industry has declined in recent years and continues to be an unstable sector. Cuts in defence expenditure by the government have had a major impact on the many manufacturers and suppliers of related products since 1990. This contributed, in no small part, to the north Cotswolds area's designation under the RDC's Cotswold Employment Programme (CEP) between 1992 and 1996. The closure of air bases provides opportunities for redevelopment, however, and this is something which one agency, in particular, is examining very closely (Agency

Interview 2, p.5). There has been a related trend in large companies in the county suffering redundancies and a substantial level of individuals thus affected have since set up in business on their own. Empirical findings in Chapter 6 demonstrated that such entrepreneurs are well represented in the sample of firms examined.

Economic diversity

Secondly, there is a significant level of diversity in the rural economy, with a perceived dominance of manufacturing and engineering in some parts of the study area. Within the sub-region of Coventry and Warwickshire there is a great diversity in industrial sectors and this is particularly well defined by location. Around Coventry and the north of the county, the prevailing industrial activity is related to manufacturing and distribution, while in the south (the study area with which this research is concerned) there is a high degree of self-employment, particularly in the marketing, promotion, software and IT industries (Agency Interview 10, p.5). South Warwickshire also benefits from the multiplier effects of a thriving tourism industry, while the image of the north of the county is less attractive and the emphasis has been more accentuated on declining heavy industries. It is the view of some agencies that the economy is very diverse, while others have suggested it may not be diverse enough, with an over-reliance on engineering. Strategy documents clearly demonstrate this to be a concern.

An interviewee in one agency also expressed concern that there has been a lack of recognition of recent changes in the economy; specifically, the increase in the service sector. This sector now employs 64% of the workforce (CWP, 1995, p.5). This may have implications for the types of provision being made by policy-makers and local authorities (i.e. inappropriate policies and measures more suited to the historically manufacturing- and engineering-biased economy of the region).

One interviewee suggested some interesting examples of diversification out of agriculture may be one reason for the increasing diversity of the rural Warwickshire economy. Another defined the economy of South Warwickshire in terms of the state

of its businesses, suggesting that there are three types of businesses within his area of influence:

- "survival - account for maybe 5% of businesses
- consolidation - account for 25-30%
- expansion - account for 70%

I am very lucky in that my patch is very prosperous in comparison with the rest of the country. Leamington was number one area in the UK, in terms of developing SME operations with a profit performance, in 1996. A lot of these companies are new companies and also foreign companies who have come in in recent years. This has ramifications (could say multiplier effects) for the rest of the economy, in that larger companies will often now look locally for their suppliers because it gives them an element of control."

(Agency Interview 9, p.5.)

Generally the Oxfordshire economy is also considered in a very positive light:

"It is increasingly varied - the economic base is diversifying as new light industrial sites have opened up. There are two or three in Chipping Norton and others in several local villages. A lot are locating outwards from London and the home counties. So we get some very interesting companies moving out - e.g. chemical design, ... jewellery, etc. So, it is a good thing because now the area is not so dependent economically on *the major employer*."

(Agency Interview 4, p.5.)

Pockets of deprivation

Finally, some pockets of relative deprivation exist within the area and these are cause for concern for policy makers. Warwickshire-based agencies were quick to point out that, although the county's economy is diverse and, on the whole, prosperous, certain disadvantaged societal groups still exist. This is the case, even in the advantaged south of the county. Moreover, these groups are further marginalized by more affluent incomers entering the county as a direct result of its attractiveness and prosperity.

Oxfordshire agencies also recognize pockets of deprivation and marginalization within their overwhelmingly prosperous county:

> "There are still areas of real deprivation. Going from recession to boom has the inherent possibility of skills problems such as shortages of skills and employers having to pay too much to get skilled people. The economy is very service biased. Manufacturing has declined, e.g. Rover used to employ 18,000 in Oxfordshire, now employs 4,500. Trends suggest that this will continue, although more slowly than previously. With this change in sector dominance there has been a shift in the types of employment from predominantly male full-time to female part-time work."
>
> (Agency Interview 7, p.4.)

Agencies, particularly in West Oxfordshire and Cherwell Districts, have been very proactive in recent years with regards bidding for government and EU funding. The closure of Upper Heyford air base north of Kidlington threatened deterioration of the local economy and thus the RDC designation of the Cotswold Employment Programme (CEP) in the Cotswolds area was also important in Oxfordshire. According to interviewees in both Agencies 3 and 4, West Oxfordshire has a particularly strong economic base because of the money which has been available in the Cotswolds as a result of this external funding. In addition, European funding has been won in association with the base's closure through the Single Regeneration Budget (Cherwell District Council, 1996).

7.3.2 Agencies' perceptions of the nature of ICT penetration and use by rural businesses

As with general economic conditions in the local rural area, a range of views exist among agencies as to the extent to which ICTs are used in businesses within their catchment areas. Not only this, but different agencies have very different levels of awareness regarding this aspect of the economy, many having treated the use of ICTs as a somewhat marginal issue up until now.

This section first looks at the perceived levels of ICT use which currently exist within firms operating in the local area over which the agencies have a responsibility.

Secondly, agencies' views regarding the potential impacts of the use (or non-use) of ICTs in rural businesses are also reviewed. Thirdly, their perceptions of the incentives and barriers which act upon entrepreneurs in rural firms wishing to invest in technology are discussed. Fourthly, the views of relevant agencies on the current trends in ICT uptake are examined and, finally, the implications of these trends for the economic development of the local area are discussed.

Throughout this section, agency perceptions are compared with the findings from the survey of rural entrepreneurs in order to assess how realistic such perceptions are in the light of what the rural business survey has found to be going on at the grass roots level. How well researched are agencies' views and do they really know what is happening on the ground? It is clearly demonstrated that, both between the agencies themselves and between the agencies and the views of entrepreneurs, there are significant differences in perceptions of the extent and nature of ICT penetration in the study area.

ICT uptake and use is low and varied

Agencies generally believe overall levels of technology uptake to be low, but to vary widely according to the type of firm and individuals involved. There is a feeling among some agency informants that rural firms may be lagging behind their urban peers in their uptake of new technologies. These views are broadly concurrent with findings presented in Chapters 5 and 6. Agencies in both Gloucestershire and Warwickshire were reluctant to estimate levels of technology uptake in rural businesses without knowing whether or not there has been any separate analysis of the rural figures. The north Oxfordshire enterprise agency NORBIS, however, perceived the current levels of uptake in *rural* businesses to be low, but found that people were "interested in ICTs and becoming more so". Both WREN and ACE, computer training centres, suggested levels of uptake to be "very low" and, indeed, "primitive". Interviewees in ACE observed that *indigenous* firms are unlikely to be "into ICTs" and that, instead, it is those firms which relocate who tend to bring the technology with them. This view was echoed by the Director of the enterprise agency for the south Oxfordshire area, TBAC, who felt that, because of the nature of the majority of

the businesses with whom he dealt, they only need what he called "the basics", i.e. phone, fax and standalone computer.

The Telecottage Association's Director believes it is very probable that rural firms have been somewhat left behind their urban counterparts, since the exposure which people in rural areas have to new technology is much lower than for those living in large towns and cities. However, HOETEC's Economic Research Executive was more positive about ICT uptake:

> "The area of skill shortage which is frequently reported is the knowledge/literacy in specific software, i.e. employers are using software, but can't find the skills to operate it. This suggests that there is a fair level of technology penetration already, in terms of businesses using it."

The Personal Business Adviser (PBA) interviewed in Business Link Coventry and Warwickshire believes that the levels of penetration are currently very varied and much depends on the types of business, with supply chain businesses and end-product manufacturers having to be comparatively well advanced in terms of their ICT use in order to be able to compete. This concurs with trends revealed by the business surveys. He estimated 40-50% of his current clients to be in the "very-much-with-it" category. In terms of the extent of use in different types of business, 50-60% of his manufacturing and innovation clients are using IT in the manufacturing process. In the office administration field it is very much dependent on the individual and how "open-minded" they are, but around 20-25% now use technology in the form which was discussed during the interview, i.e. ICTs. As for the tourism and distribution/logistics fields (both of which are important components of the Warwickshire economy), levels of ICT use are currently very low, except in the case of large distribution companies who have automated their stacking and self-selection systems. Coventry and Warwickshire Partnership's Executive Manager also believed there to be "enormous benefits for people working in the supply chain industries", but was unable to comment on current uptake in the sector amongst *rural* businesses.

From this brief analysis, it would appear that the general picture held by agencies is one of low levels of technology penetration among the majority of rural businesses, with higher levels of technology use among larger firms, those locked into supply chain relationships and those that are incomers. Lower levels of uptake are believed to exist among indigenous firms. The variation of uptake by type of business would also seem to be broadly concordant with the findings presented in Chapters 5 and 6. Agencies do not, however, make any distinction between those firms which are independent single site concerns and those which operate as part of large multi-national, multi-site companies. This research found the former to have lower levels of ICT uptake, while the latter had both higher levels of uptake of technologies in general and a higher degree of susceptibility to the use of advanced ICTs. This was found to be due to specific communications needs resulting from geographical remoteness.

Impacts of ICT use

Many of the agencies' views on the potential impacts of ICT use in rural businesses closely mirror those of rural entrepreneurs. A range of both positive and negative impacts were mentioned. On the positive side, interviewees felt that the use of ICTs can be beneficial in the following ways:

1. Potentially there is a financial benefit, for example, from computerizing accounting.
2. ICT use is "a way of keeping the economy alive - there is more chance of infrastructure and services staying if people are living and working there ... if you can keep a diversity of people in the rural economy it can then move forward instead of shrinking".
3. "I, personally, am very pro the use of technologies - anything that saves time and improves the quality of procedures is bound to be a good thing."
4. They have the ability to reduce distance-decay.
5. The associated need for training and support services ought to create more jobs.
6. Using ICTs means that rural businesses can compete on the same platform as urban businesses.

7. ICT use can help break down barriers between businesses and encourages growth in consortia which are now viable between rural and urban-based firms.
8. In the right circumstances, and when used in the correct and appropriate manner, ICTs can create wealth and help a business and economy to thrive.

However, detrimental effects were also recognized by some of the agencies surveyed:

1. The technological treadmill effect was raised by a number of agencies: "if you don't get into it you could be in danger of getting out of touch"; "without ICTs, small companies are excluded from dealing with larger companies".
2. ICT use is "still having a negative effect on jobs, but at the same time businesses cannot be truly effective without it".
3. There are dangers in becoming too reliant on particular pieces of equipment which, if they fail, can paralyse a business.
4. There is the possibility of "backroom data-crunching" being contracted overseas where wages are much lower, thus exacerbating income polarization between core and peripheral countries and removing potential sources of employment from the home market.
5. ICTs "can be seen as a panacea, which is not helpful".
6. If everyone is investing, everyone has a huge increase in productivity - "where are all these products going to go? In this area, industry has grown up around a supply chain; by creating expansion in one company you could be creating the demise of another".

Agencies perceive the increased use of ICTs among rural businesses to be, for the most part, beneficial for both those firms adopting technologies and for the wider economy in which they are operating. However, they are also clearly aware of the potential negative impacts which ICT adoption can have. The relative lack of any coherent strategies concerning ICT uptake in the local economy might, therefore, be seen as a cautious reaction to rapid and uncertain change by agencies suffering from a shortage of reliable information.

Barriers and incentives to ICT uptake

Agency interviewees were questioned as to their knowledge of existing barriers and incentives facing rural entrepreneurs wishing to invest in ICTs. There was overall consensus that three main barriers exist. The first and most influential of these is financial. The scale of the initial investment needed up front, coupled with the on-costs of running and up-dating systems, is prohibitive for most firms as the vast proportion of them are extremely small and short of resources, both financial and human. One agency which has been trying to target agricultural-based businesses also pointed out the particular problems for those involved in this sector. Farmers pay twice for their efforts to invest in technology - first, in terms of the money it costs them to acquire the necessary equipment and training; and secondly, in the money lost through time spent training in technology use rather than on the farm. This represents a substantial disincentive to ICT adoption. Furthermore, another agency highlighted the particular practical investment problems of rural firms in terms of their proximity to potential lenders. As banks have closed down more and more branches, the number which remain in rural areas has fallen disproportionately more than in urban areas.

Secondly, lack of knowledge, both of the technological solutions which exist and of the support services available, is the next most significant barrier to ICT uptake. Smaller companies can't necessarily afford to have an IT expert and are thus less likely to have the knowledge of how technology can improve the business. This lack of knowledge is also related to fear of technology, particularly against a backdrop of so much media hype, and a reluctance to get involved. Related to the knowledge factor, most agencies agree that there is a lack of impartial advice available to businesses wishing to get information on equipment and software selection. For the uninitiated, this gap in information provision is exacerbated by the existence of such a large and confusing array of options.

The third main barrier to ICT uptake is training. Training in ICT skills puts a particular strain on the resources of small companies, in terms of both the financial costs and the time involved. There is a lack of ability to see training time, not simply as a short-term cost, but as a long-term investment.

It is interesting that these three major barriers noted by agencies (finance, knowledge and training) are also reported by rural entrepreneurs as being significant disincentives to ICT adoption. It is important to note, however, that although there is consensus between agencies and firms in this respect, agencies have not, on the whole, risen to the challenge of effectively meeting these requirements which they acknowledge businesses should have. This, of course, is not true of all agencies, but is apparent in many whose views and perceptions would suggest that their current strategies require substantial change.

With so many agencies working towards economic development in the study area, it is perhaps surprising how few tangible incentives exist for firms wishing to use ICTs. There are, according to the agency interviewees, no material incentives provided, either by central government or from any other source. The few 'incentives' which do exist are really better described as general business support and these are provided by, in particular, the Business Links. These include free independent advice and guidance, subsidized training, support, management development and consultancy from external specialists. These services are now being tailored in some Business Links to encompass ICTs. As will be seen in section 7.4.2, Business Link Gloucestershire, the ACE Computer Centre in Chipping Norton and WREN Telecottage in Warwickshire provide expert specialist advice and practical support such as training in ICT use. TBAC and NORBIS in Oxfordshire and Business Link Coventry and Warwickshire, although to a lesser extent, also provide support in the area of ICT use.

In addition, government incentives primarily focus upon other business issues which may provide opportunity for ICT investment. Some of these measures include grant funds provided by local authorities for small businesses to grow; the Government Loan Guarantee Scheme, which allows usually non-limited companies to borrow while the government shoulders 85% of the risk involved; and export vouchers, whereby assistance is provided for innovation in technology (i.e. SMART and SPARE Awards). Essentially, however, there is no "free money" - measures usually employ

'matched funding' whereby 50% of the total must be raised by the recipient of the funding and the remaining 50% is matched by the funding body (Agency Interview 2, p.5-6). In fact, sources of potential funding are so limited that one interviewee remarked "now it's always work in partnership - there's no money at the end of it". Another interviewee emphasized that the lack of incentives, and particularly the lack of any clear government policy on this issue, means that ICT uptake is really left to businesses themselves: "unless the business can see the benefit for itself (maybe through its strategic plan), there is no government plan, no government help line or anything like that" (Agency Interview 4, p.5).

It is worth noting, however, that since this research was carried out the business use of ICTs has gained more prominence in the national government agenda. The DTI has introduced the Information Society Initiative (ISI), one component of which is a helpline (accessible by phone, fax and e-mail) and set up specifically to provide ICT-related advice for businesses.

Trends in ICT uptake among rural businesses

Against this background and in spite of the obvious lack of incentives (especially for small businesses) to invest in new technologies, most agencies believe that the general trends in uptake of ICTs among rural firms operating in the local area are of steadily increasing use. Business Link Gloucestershire's Senior Business Adviser suggested that the Internet is "the key technology at the moment", particularly for a lot of small rural businesses who are producing niche products, as it is the only way they can compete effectively through the supply chain. Such specialist products, for which there is not a high demand, "can be marketed very successfully and directly on the Internet". In concurrence with the findings of this research, the Senior Business Adviser reported that EDI is being used increasingly for dealing with larger companies. Also, many agency interviewees suggested that one of the most widespread uses of technology is in accounting and financial controls. This is supported by the findings of this research. The view of HOETEC is that technology is now extending into smaller organizations, generally as a result of improvement in IT

literacy and education. This enhances companies' opportunities of using IT by ensuring that there is now a larger pool of appropriate skills in the workforce.

However, as with levels of technology uptake, some agencies fear that indigenous firms are not keeping up with national and urban trends in ICT uptake. As the interviewees in ACE computer training centre commented, "it's the sassy incomers who are making most of the running and the local businesses already there are lagging behind somewhat".

Implications of current trends

The implications of these trends, as perceived by agencies, are interesting as they reveal inconsistencies between the perceived magnitude of the potential impacts and the extent to which ICT use has actually been incorporated into current economic development strategies. There seems, overall, to be a lack of in-depth knowledge on the range of impacts which ICT uptake and use in rural businesses may have on local economic and social conditions. Two opposing viewpoints are represented by agency informants.

Some agencies present a more negative outlook. HOETEC's main concern is over the potential loss of jobs in the area, while TBAC's perception of the possible implications is that ICTs "won't have a major impact on the economic development of the area. The economy will be stimulated by the people here and the 'feelgood factor'".

One interviewee expressed concern over the diversity in ICT uptake, believing that small family businesses and small retail businesses might be left behind as other businesses rapidly become more technology intensive. He noted that implications of the trends would be very specific to individual firms. Others felt that, contrary to there being problems related to mixed levels of uptake, there could be worse problems if all businesses were adopting ICTs uniformly.

> "If Coventry and Nuneaton had increased their use of technology and their productivity at the same rate as my patch *(referring to south Warwickshire)*, we could have a bit of a nightmare scenario! ... Competition would be intense and over-production due to increases in productivity, associated with the introduction of technology into manufacturing processes, would become a real problem".

Others are more positive about potential implications: interviewees at the ACE training centre in Chipping Norton suggest that the current trends, even though led by incomers, bring new people and ideas into the area, "which is traditionally the way that communities have always moved ahead".

Business Link Gloucestershire's Senior Business Adviser put forward several further positive implications of the current trends in rapidly increasing technology uptake. Firstly, there is the advantage of the Internet as a marketing tool for particular types of business. Secondly, the movement to EDI has allowed smaller companies to deal with much larger ones, but there is still a need for small firms to attain recognized quality standards, such as ISO9000, in order to supply large customers. Thirdly, the uptake of technology provides an opportunity for more and more people to work from home, thus reducing the levels of commuting. Finally, the increased penetration of advanced technologies means that new business, technology and PC skills are being developed within the local population; this will have knock-on beneficial effects for employers and (potential) employees alike.

Having examined the ways in which the many different agencies perceive ICT penetration among businesses in their local economies, there are clearly variations in views between different agencies. Many of these differences, however, are largely due to the varying nature of these agencies' respective roles within the economy. In addition, many similarities were observed between agency perceptions of the local economy and the model of the rural economy identified by this research.

For instance, agencies believe technology uptake to be low and varied among local rural businesses. This is in line with the research findings, particularly the extensive survey. In addition, some believe that rural firms are lagging behind their urban

counterparts in their levels of technology use. However, the main points on which the findings of this research differ from the views of agencies are threefold. First, although agencies believe there to be variation in ICT uptake, they do not recognize a distinction between inwardly-oriented and outwardly-oriented firms identified in Chapter 5. Second, agencies do not acknowledge the very high level of ICT penetration which is present in some local firms. Third, they believe incoming firms to be 'making all the running' in the drive to incorporate ICTs into their business; the qualitative stage of this research has shown that the issue is not so clear cut.

7.4 Agencies' approaches to policy

Having built up a picture of agency perceptions, it is now possible to make a more informed assessment of their various approaches to rural economic development, the role of rural businesses and the business use of ICTs. This section considers the various strategies put forward by the external agencies and organizations active in the study area. Areas of strength and weakness are identified with a view to assessing the extent to which ICT use has been effectively incorporated within agencies' current development work. The final chapter then builds on this information, suggesting ways in which agencies' approaches to ICTs, rural businesses and rural development might be modified in the future.

Agencies' approaches to the three main aspects of the rural economy are dealt with separately: firstly, approaches to rural economic development; secondly, to rural businesses and; finally, to the uptake and use of ICTs within these businesses. Four main findings emerge from this stage of analysis.

Firstly, and most importantly from the agency point of view, ICTs all too often present a concept of the businesses of tomorrow; something which agencies believe they will have to support in the future. Evidently, many agencies are still lagging well behind the firms which they are meant to be supporting. Secondly, no specific *rural* economic development policy exists; most agencies feel that their strategies implicitly provide for the rural dimension as they are based in predominantly rural areas. Thirdly, the very small one and two person firms (i.e. microbusinesses) do not come

under the specified remit of the major agencies. This is a matter for concern, since it is often these firms who stand to gain most from the new ICTs which allow microbusinesses to avoid 'downtime' and maintain a presence even when the entrepreneur is not there. Finally, support for indigenous firms often 'takes a back scat' in agency strategies, while priority is given to attracting inward investment and firms from outside the local area.

7.4.1 Approaches to rural economic development

In theory, "economic development involves everyone in the community or anyone with a connection to the area" (CWP, 1995, p.2). Parties involved in formulation and implementation of economic development strategies include a diverse mixture of public and private sector organizations from the national to the local scale. Central government provides a range of specific agencies and funding for dissemination at the local level. Local authorities, most commonly district and county councils, are crucial actors in the overall economic development of an area, since it is with them that the main responsibility for creating and co-ordinating economic development policy lies. In addition to policy formulation at the local level, local authorities also have powers to co-ordinate and support various economic development activities and to support elements such as education and planning in the local area. One of their most important advantages is their permanence which is generally greater than other agencies and private sector organizations which may be operating within the local authority area. Finally, there are the independent agencies working in local areas. Such agencies often, and indeed increasingly, work in partnership with local authorities and bodies under the control of central government in the formulation and direction of policy. This network of bodies which is involved in the implementation of economic development strategies is generic to both rural and urban areas.

The research points to two main features of agencies' approaches to rural economic development: partnership formation and the absence of rural specificity in support. There are significant moves towards co-operation between agencies and, indeed, between public and private sectors. In the study area a network of government bodies, local authorities, independent agencies and partnerships exists. For the purposes of

economic development policy formulation and implementation, these various organizations generally operate at the county and district level. In all three counties comprising the study area, it is clear that policy remains firmly within the domain of the County and District Councils. Most agencies either have no 'policies' as such and tend to be working instead to agreed strategies or targets, or to be working within the remit of the overall economic development plan put forward by the relevant local authority. The main strategic objectives drawn up by partnership bodies across the study area are broadly similar, as Figures 7.1, 7.2 and 7.3 show.

Figure 7.1 Economic strategy for Gloucestershire

Gloucestershire Partnership: mission statement

Our aim is to ensure a secure, sustainable, growing economy for Gloucestershire, its businesses and its people. Our vision is to establish Gloucestershire as a leading UK county, without in any way impairing the quality of life it has to offer.

Gloucestershire Partnership: strategic objectives

1. **Growing business:** to retain and develop a supportive business environment and broad economic base that will foster strong growth potential for jobs and attract inward investment
2. **Technological strengths:** to provide a technological business environment of the highest quality to enable companies to be internationally competitive
3. **Skills and opportunities:** to adopt a strategic approach to guidance and lifelong learning
4. **Culture and creativity:** to develop Gloucestershire as a centre of cultural and educational excellence and diversity
5. **Building communities:** to address the issues of social exclusion and poverty
6. **The quality environment:** to ensure that economic development maintains and enhances the high quality of the environment in Gloucestershire
7. **Winning resources:** to take every available opportunity to compete for external funding.

Source: GCCI, 1996, p.4.

Figure 7.2 Economic strategy for Oxfordshire

HOETEC: mission statement

To inspire employers and motivate individuals to seek and to achieve success in a globally competitive economy through excellence in training and education.

HOETEC: strategic aims

1. **Shared economic agenda:** to be a major force in the implementation of a strategy which contributes to the sustainable development of Oxfordshire, both economically and in terms of 'quality of life'
2. **Lifelong learning:** to establish a lifelong learning culture within Oxfordshire to convince individuals of the economic and quality of life benefits of education and training and to meet and exceed the National Training and Education Targets
3. **Business competitiveness:** to improve the competitiveness of businesses as a pre-condition for sustainable economic development
4. **Benchmarking and evaluation:** to research and develop means of benchmarking Oxfordshire's performance against 'role model' European regions
5. **TEC performance:** to develop the TEC's ability to best serve the economic development process and the local community.

Source: HOETEC, 1995, p.19.

Figure 7.3 Economic strategy for Coventry and Warwickshire

Coventry and Warwickshire Partnerships: mission statement

The partners will strive towards a lasting prosperity for the whole of the sub-region to which every local person will have the opportunity to contribute and benefit. The wealth-generating potential from achieving manufacturing and engineering excellence and promoting quality in the development of service sector industries and tourism will be used to stimulate social and environmental improvements and maximise the opportunities, and understand the difficulties, for everyone to develop their talents to the full.

Coventry and Warwickshire Partnerships: key objectives

- **Physical:** I to promote a high quality and safe physical and social environment
  II to strengthen communications
  III to strengthen the industrial and commercial property base
- **Business:** IV to promote the sub-region as a business investment location
  V to strengthen and diversify local business
  VI to support the development of leisure and business tourism
  VII to foster research, development and advanced technology training
- **Human:** VIII to develop workforce skills and enhance employment potential
  IX to support disadvantaged groups and communities
- **Advocacy:** X to secure external support.

Source: CWP, 1995, p.4 & 8.

Targeting of activities

In terms of targeting their strategies, local authorities and other agencies do not specifically target *rural* areas or *rural* businesses. The extent to which economic development policies have a rural focus varies within the study area. In the south of the area, in Oxfordshire and Gloucestershire, agencies are working in what they term "essentially a rural area". The built up areas are comparatively small and most businesses are operating in rural areas or small market towns. Policies take into account this measure of rurality. In contrast, the north of the study area is covered by

external agencies who are concerned with the welfare of Coventry and Warwickshire's economy as a whole and the rural focus is much less evident, as organizations have to deal with a substantial urban industrial area.

The view of Business Link Gloucestershire is that the county is mainly rural and thus the plan takes this into account: "Rural businesses fit within the overall business plan" (Agency Interview 2, p.2). In Oxfordshire, informants expressed similar views on rurality:

> "Does the agency have a rural economic development policy?
> This is an interesting debate because Oxfordshire is almost entirely rural. ... [The agency] is very committed to the individual towns around Oxfordshire ... [we] concentrate on working with existing businesses in small towns because they are being hit by the big shops and supermarkets."
>
> (Agency Interview 3, p.3-4)

> "Does the agency have a rural economic development policy?
> No, because we regard Oxfordshire as rural anyway, so our economic strategy takes account of the fact that Oxfordshire is rural."
>
> (Agency Interview 7, p.2)

HOETEC's economic development strategy is:

> "for everybody in the county - companies and individuals ... [but] ... it is generally targeted at people who can make an impact on the general economy as a whole. ... The Corporate Plan - for the next three years - is mailed to key individuals in Oxfordshire's business community."

In spite of the extremes of the rural-urban spectrum represented in the area served by Coventry and Warwickshire Partnerships, they:

> "do not believe there is a need to differentiate between urban and rural areas."

Similarly, a partner agency operating in the same area, covering the same diversity of locations, has a broad economic development policy "for businesses *per se* - we do not distinguish by location" (Agency Interview 9, p.2). In fact, on further questioning, the agency's policy **is** specifically targeted at certain businesses, but the division is sectoral:

> "particularly at manufacturing (for example, it is very much automotive around here *(Coventry)*), also distribution (because of the motorway network) and IT (from electronic manufacturing to software developers and those who service and maintain PCs, etc.) and, finally, tourism"
>
> (Agency Interview 9, p.2).

7.4.2 Agencies' support for rural businesses

The agencies interviewed were all approached because of their particular focus on supporting the businesses in their local areas. The agency survey revealed a significant level of business support from agencies within the study area. It also indicates that this varies widely in terms of the type of support given, the cost of this support and the types of businesses which are targeted by different agencies.

In essence, there are two main strands of agency support for businesses - general business support and support which is specifically oriented towards ICT use. This section illustrates examples of each in turn. Firstly, general business support is of several types:

- counselling/advice
- premises provision/managed workspace
- information about and assistance in accessing funding
- venture capital advice
- encouraging inward investment
- training provision.

Counselling and advice

All of the agencies approached offer advice on general business matters, some offering more practical support as well. Their target audiences also vary. Business Link Gloucestershire, for example, deals with all firms in the county in three size bands: 1-10 employees, 11-50 employees and over 50. In terms of the stages of growth and development of these businesses, advice and support are tailored to three basic categories of business:

> 1. "Business set-ups: free counselling, training and access to Business Link specialists, services and information)
> 2. Established businesses: business advice which is essentially free[3], access to specialists, secondary services (some of which again are free) and information services
> 3. Businesses with problems: a 'Rescue Service' is provided which, again, is essentially free"
>
> (Agency Interview 2, p.3)

North Oxfordshire's enterprise agency, North Oxfordshire Business Venture Limited (NORBIS), provides "business planning and financial organization support - talking through ideas and providing impartial advice on business matters". TBAC provides support in "getting counselling out to businesses".

Business Link Coventry and Warwickshire assists businesses mainly in terms of "information provision, advice where it is pertinent and more than this is provided through the mentoring service which provides one-to-one on-going support at the end of a telephone line and at the site itself" (Agency Interview 9, p.3). Business Link supports firms employing ten or more people, but particularly manufacturing and engineering firms and also distribution companies. This is a direct result of the dominance of these sectors in the Warwickshire economy, especially in and around Coventry. One engineering firm which benefited from the support provided by

[3]Business Link does not charge consultancy fees *per se*; charges are only made for tangible items such as the drawing up of a business plan or similar and the costs are always agreed upon with the business first.

Business Link had been designing and manufacturing farm machinery for 35 years. This firm's experience exemplifies the type of support Business Link can provide:

> "As the business developed they had contracted a lot of their supply chain overseas. This turned out to be very costly when they found themselves very vulnerable to foreign currency changes and exchange rate fluctuations. They found that a sudden change in the Japanese yen almost doubled the cost of some components overnight. I got them to look at UK suppliers and to reinvest and manufacture some of the parts themselves, which, although it required a substantial initial outlay, stabilized the business in the long run."
>
> Agency Interview 9, p.3-4.

Premises provision and managed workspace

The provision of appropriate premises is a crucial element of many agencies' work, since rural areas often suffer from a shortage of business accommodation which is suitably sized and equipped for small firms. There is a particular problem for young and expanding firms, as they can rapidly outgrow their existing premises. TBAC sees its major role in business support as assisting firms to find suitable premises for any particular stage in their development. This work is linked to the provision of "incubator units" for small growing businesses in hi-tech industries.

North Oxfordshire's enterprise agency, North Oxfordshire Business Venture Limited (NORBIS), also takes the view that one of the most important aspects of business support is "to provide affordable premises like managed workspace ... we often get asked about availability of premises".

Information about and assistance in accessing funding

Funding available for rural businesses is a complex and changing area and most of the agencies surveyed are involved in making this information accessible to local firms and assisting them in accessing relevant funds and grants. For instance, in the case of Gloucestershire businesses, two types of business support are available from central government. Local Challenge funding encourages Business Links to develop partnerships with the public sector in order to provide new services for businesses.

Sector Challenge funding is directed to industrial sectors and trade associations and involves bidding for funding, usually in conjunction with TECs, to encourage joining up with local support agencies. Business Link Gloucestershire is responsible for disseminating this information to their client businesses. Notably, though, there is no specific focus placed on rural businesses as Gloucestershire is "mostly rural". The RDC do provide funding in the Forest of Dean Rural Development Area (RDA), but this area falls outside the limits of this study.

Venture capital advice

A common problem for small and young businesses in rural areas is accessing venture capital to finance growth, expansion, research and development. Some of the agencies surveyed have recognized that this problem is heightened as a result of remote location relative to the main banking centres such as the City of London. Business Link Gloucestershire provides a specialist service, the Business Angels Scheme, which assists small local businesses seeking venture capital for expansion by putting them in touch with potential investors, i.e. Business Angels. A Business Angel "is generally a private individual with both an interest in and the means to provide support for local businesses" (Gloucestershire Business Angels Scheme brochure, Business Link Gloucestershire). Business Link, in this instance, acts as a business introduction service and ensures that businesses seeking funding draw up a suitable business plan. The agency does not advise on the potential risks of any investment.

The Business Angels Scheme has been successful for many Gloucestershire companies, one example of which is a furniture maker who benefited from the scheme in terms of practical sales and marketing support. The company was set up by an individual with expertise in furniture making but who was not accomplished in marketing and administration skills. The company was only selling to wholesalers and distributors and maintaining a turnover of £250,000 to £400,000. Business Link Gloucestershire matched the company with a Business Angel, "an individual venture capitalist who was willing to provide high risk finance. As a result *[the business]* has

now re-located, *and* is selling direct to major retailers and turning over £750,000 a year" (Agency Interview 2, p.4).

Encouraging inward investment

Inward investment is high on the agenda of particularly the umbrella agencies and partnerships in the study area. Encouraging only *appropriate* inward investment is seen as a crucial factor in maintaining the attractiveness of Oxfordshire as an investment location and as a pleasant environment in which to live. However, this does not directly benefit indigenous local firms and, indeed, may have detrimental effects on their trade. Incoming competitors receiving favourable (e.g. tax-free) conditions will have a distinct advantage over indigenous firms.

Coventry and Warwickshire Partnership's activities, for example, would appear to be more keenly focused on attracting new inward investment than on supporting existing businesses. Its main work is in the

> "wooing, courting and assisting of incoming businesses - we are in the business of trying to get inward investment. We are trying to get the City and County Councils to work more closely together to work out a programme of promotion and aftercare."
>
> Agency Interview 10, p.3.

Given the recognized differential in technology use between incoming firms making extensive use of technology and indigenous firms tending to be much less technology aware, it is of some concern that CWP's interest is mainly directed towards incomers. If the major co-ordinating partnership body in the county is not providing support for its local indigenous businesses in the uptake of ICTs, then the likelihood that such firms will continue to lag further behind newcomers is increased.

Training provision

Some of the agencies surveyed run training programmes in a range of business skills. For example, specific policies set up within the TEC structure to help businesses include Investors in People (IIP), a scheme to encourage firms (primarily those employing more than 50 people) to invest in continual staff training in order to

promote and maintain higher levels of skills within the workforce. Employee Development and National Vocational Qualification (NVQ) Development are also key TEC areas. "In all three of these, the ethos is to encourage training and, by doing so, to secure companies' futures and thus the future of the economy as a whole" (Agency Interview 7, p.3). The interviewee admitted that these strategies were biased towards larger firms and that enterprise schemes which helped smaller firms had now been stopped. This suggests that smaller firms must seek help elsewhere. The Business Links are only intended to deal with those firms employing between 10 and 200 people. In addition, the actual type of businesses which may be eligible for TEC assistance is agreed at a national level. According to the DTI, "only businesses of between 5 and 200 employees are eligible for TEC advice or assistance", although some TECs do claim to support them all. On the whole, however, many of the smallest firms in the study area are likely to find support only through the enterprise agencies, such as TBAC and NORBIS.

Critique of general business support

The research identified a number of deficiencies in the provision of general business support in the study area. These are related to both the type and level of support actually provided by agencies (in relation to the requirements revealed by the survey of rural entrepreneurs and decision-makers) and to the way in which this support is perceived by local businesses.

Firstly, there is a limited awareness among SMEs of the support measures currently available. This is exemplified by statistics collated by TBAC to monitor their activities. These figures, recorded on a monthly basis, illustrate the broad range of enquiries which TBAC receive from local businesses, but also serve to highlight the low level of enquiries originating from the industrial sectors with which this research is concerned, i.e. engineering and other manufacturing. The data show that manufacturing and engineering firms (including automotive firms which are listed separately in TBAC's records) account for only 6% of the total enquiries received. This would appear to be representative of the very low level of awareness and use of external advisory agencies found among entrepreneurs interviewed in the business

survey of manufacturing and engineering firms. It is also interesting to note that, in terms of the type of advice sought, the records contain no specific category for enquiries relating to IT, let alone to ICTs. This demonstrates the reticence with which the need for IT support is being recognized by many agencies.

Secondly, a lack of support for the smallest firms is clearly evident. A number of interviewees admitted that their strategies were biased towards larger firms and that enterprise schemes which had helped smaller firms had now been stopped. This suggests that smaller firms must seek help elsewhere. Even Business Link only deal with those firms employing between 10 and 200 people, so many of the smallest firms in the area are likely to find support only through the enterprise agencies, TBAC and NORBIS. Furthermore, the actual type of businesses which may be eligible for support from some agencies is agreed at a national level; for instance, according to the DTI, "only businesses of between 5 and 200 employees are eligible" for TEC advice or assistance. However, Coventry and Warwickshire TEC do claim to support them all, "especially the service sector and manufacturing companies" (Agency Interview 1, p.3).

Thirdly, in view of the highly differentiated nature of some of the economies bordering the study area, it is perhaps surprising that no specific *rural* focus is placed on agency support strategies. This is exemplified most clearly among those serving the Warwickshire districts. In Warwickshire, a range of agencies caters for different types of business in terms of their size and the type of product or service they provide, rather than the degree of rurality of their location. However, there is also evidence to suggest that there is an awareness, in some agencies at least, of the need to tailor business support mechanisms to cater for the particular needs of *rural* firms. Warwickshire County Council and Stratford District Council commissioned a study into rural socio-economic conditions which put forward recommendations for resolving key issues affecting both the social and economic environment in the rural parts of the county. As yet, however, it appears that the agencies responsible for business support in Warwickshire are largely indiscriminate in their treatment of

businesses, although the interviewee from Coventry and Warwickshire TEC expressed enthusiasm for a "rural focus" in the agency's *future* business strategies.

The second type of business support is that which has a specific focus on ICT implementation. In the study area, this strand is less well developed. In many instances there is more speculation than action. Nevertheless, a number of support measures can be identified:

- information provision
- training provision
- facilities provision on a 'shared resources' basis
- 'try before you buy' exhibitions of hardware and software
- specialist IT advisers.

Information provision

Providing general information to businesses underpins the work of most of the agencies surveyed. Some also provide information on ICT-related issues. For example, the work of the Telecottage Association (TCA), based in Gloucestershire, revolves around dissemination of information on ICTs (and telematics in particular), although the focus is more on teleworking than on-site integration of such technologies in established firms. In advising would-be adopters, the interviewee draws on his experience of using certain products, but makes it clear that he is not necessarily endorsing any one in particular. He believes that one of the most important steps in researching potential ICT solutions is to talk to peers in the same business sector to see what equipment or services they are using and learn from their experience in using the technology.

The Telecottage Association is a registered charity and so works in conjunction with various funding bodies and other organizations as it does not have the resources to work alone. The association is the UK national representative for the European Telework Development Project and has also worked with both the RDC and ACRE on various projects in rural areas such as refurbishment and installation of telematics in

village halls. However, as a result of the association's national coverage, most of this work to date has been conducted in the West country rather than within the research study area. The actual presence of the TCA in Gloucestershire, however, is likely to raise the profile of ICTs for business use locally.

TBAC "try to inform on the technology front" (Agency Interview 3, p.5). In practice, as discussed previously, the agency is much more focused upon general business enquiries rather than on IT support. However, through the Business Club run by the agency, some speakers have been brought in to talk to local entrepreneurs about technology and communications issues relating to business. Some of the more recent talks have covered subjects such as 'How to use Internet', 'Effective Use of Telephones', 'Mobile Phones versus Pagers' and 'The most Effective ways of doing Business Communications'. The advice TBAC gives to entrepreneurs wishing to invest in technology within their business is threefold:

> "you need to understand where the benefit is to the business
> you need to assess the likely total impact of the technology on the business
> the technology must become an integral part of the business plan"
>
> (Agency Interview 3, p.6).

Similarly, Business Link Coventry and Warwickshire promotes the use of ICTs in business through seminars and via the work of Personal Business Advisers, but there is no *specific* emphasis on ICTs - they simply come under "all aspects of business". The general advice given to entrepreneurs who wish to introduce technology into their business is, again, cautionary:

> "I would say 'let's have a look at your business first'. I would see how the entrepreneur thought the technology was going to fit into the business. Sometimes technology can come at the wrong time. If I thought the time and the situation was right and that technological solutions would fit the specific requirements then I would encourage them to invest. But sometimes it is not right and people can miss the concept of what the business is - they are too preoccupied with the technology which they believe will be the answer. Technology doesn't necessarily solve the problem."
>
> (Agency Interview 9, p.6.)

Training provision

A number of the agencies surveyed are involved (either directly or indirectly) in providing ICT-related training for local communities. For example, Oxfordshire's ACE Centre, working in conjunction with the Heart of England TEC (HOETEC), runs courses to train staff of local businesses in the use of ICTs such as EDI (Electronic Data Interchange). Most of the benefits to businesses in the area relate to training and upgrading of skills in word-processing and spreadsheet packages. One of the interviewees provided an example of the type of assistance the centre provides.

> "A local estate agency recently sent all twelve of its staff *[to the centre]* on computer training courses in Microsoft Office and has benefited a lot from doing so. All twelve got up to speed on Word 6 and Excel in one fell swoop."
>
> (Agency Interview 4, p.3

However, the interviewees pointed out that one of the more important aspects of the support the ACE Centre provides is interpersonal networking of individuals who attend training courses. "There is a very social aspect to coming on the courses - people talk to each other and find out what others are doing. They do a fair bit of information swapping." It was also stressed by the Head of Community Education that the centre promotes the business use of ICTs simply by its very presence as a source of expertise. "There is plenty of anecdotal evidence for this. A business can go and invest in hardware and software and know that there is advice around the corner" (Agency Interview 4, p.4). The belief of the interviewees is that the use of ICTs in business "has a tremendous resonance with a rural way of life. It frees up the

need for transport all the time and it is very eco-friendly. It enables people not to be in the nine to five rat race" (Agency Interview 4, p.6). In terms of future ICT-related training provision, "the centre does have plans for more specific ways of helping businesses, such as tuition in computerized accounts" (Agency Interview 4, p.3).

Facilities provision on a 'shared resources' basis

One of the more widely publicized methods of ICT promotion among small enterprises in rural communities is the provision of shared facilities - usually known as telecottages. The most active agency in Warwickshire, in terms of ICT promotion, is WREN Telecottage, although its work is mainly with individuals and teleworkers rather than with firms. WREN follows a philosophy which is not technology driven; rather it first examines the specific applications of the technology. The telecottage's main advice to potential investors in business technology is:

> "Try before you buy. Come here first. Use what we've got. Have a business counselling session. Then go and invest. Consider whether you really need to invest for yourself or whether all you need to do is to come over here once a week and use our facilities."
>
> (Agency Interview 5, p.4.)

One of the Telecottage's major goals for the immediate future is related to promoting business use of the World Wide Web (WWW) and making it more accessible to rural businesses:

> "The uptake of ICTs is relatively low. We want to focus on the World Wide Web as a marketing tool. People need to get past the hype - they will then be much more likely to get into using it."
>
> (Agency Interview 5, p.3)

In terms of the types of business for whom the telecottage caters, engineering and other manufacturing firms are not at the forefront of the support provided:

> "We tend to help service businesses because they have more interest and more need. Very new businesses also find it easier to go the ICT route and such businesses that we help also tend to be home based."

However, as the interviewee explained, there are some plans to increase the business support arm:

> "We would like to have more funding for an integrated package to provide business support. Business Link would like us to do the outreach to rural areas. One of the problems we have is that we are paid to do the business counselling, but not the promotion of the services and support we can offer. The challenge is to put together a focused project that has the money to let us do things properly"
>
> Agency Interview 5, p.3.

Other examples of shared facilities in the area include those managed by TBAC in conjunction with the Oxford Trust "who provide 'incubator units' for people to get started in the technology field. They are just trying to develop the technologies, but they don't have the business knowledge that goes with it - we provide that" (Agency Interview 3, p.5).

'Try before you buy': exhibitions of hardware and software

Of the agencies approached in the study area, by far the most forward thinking in terms of its ICT strategy for rural businesses is Business Link Gloucestershire working in conjunction with Gloucester Development Agency (GDA). The Senior Business Adviser at Business Link described the innovative way in which the agency supports ICT use among the businesses which it supports.

> "Business Link Gloucestershire were the first to provide a 'Computers in Business' service which provides advice on ICT issues. We were also the first to set up a 'Vision Centre' where business people can come in for advice on ICTs and to have a look and a play on the machines."

The IT Vision Centre is the first of its kind in Britain and is housed within the same building as Business Link, the GDA, the Gloucestershire Chamber of Commerce and Industry and other similar bodies.

> "The IT Vision Centre has been conceived by the local business community and developed by Gloucestershire Development Agency's IT sector group to provide impartial and independent advice and support for all businesses in the county. The advice is provided by Business Link, in collaboration with its partners and private sector organizations, whose vision is to help local companies benefit from the many opportunities available to them through computer technology."
>
> (Business Link Gloucestershire, IT Vision Centre promotional literature.)

The centre houses a range of up-to-date ICT equipment with a variety of business applications. Local business people can come in to the centre for impartial advice and hands-on inspection of the range of current business applications. Both hardware and software are provided by local IT systems suppliers. Thus the centre plays a dual role in providing both a practical information source for potential buyers users and a marketing outlet for the local providers of the equipment and services.

The IT Vision Centre provides help for businesses at three levels of IT experience:

1. businesses with little IT experience
2. business with IT experience
3. IT experts and professionals.

The precise services provided vary for these three distinct groups and range from free hardware and software demonstrations and help with buying, up-grading and extending computer systems to video conferencing, E-mail, Internet and multimedia, computer networking, user forums and access to information, research facilities and new IT developments.

In addition, Business Link Gloucestershire collaborates with local educational establishments, such as Cheltenham and Gloucester College, and work with the GDA, the RDC, the TEC, the local authorities, the Federation of Small Businesses and The Cinderford Partnership based in the Forest of Dean. Through the government's Information Society Initiative (ISI) they are also looking at ways to establish networking links with and between rural businesses.

Specialist IT advisers

Partly as a result of the government's Information Society Initiative (ISI), the Business Links are increasingly employing Personal Business Advisers with specific expertise in IT. The Gloucestershire Business Link is particularly progressive in its ICT strategy, aiming to promote the use of ICTs in rural businesses and to provide a comprehensive support service. One way in which this is achieved is by training all business advisers so that "those individuals who go out and visit companies ... have a good knowledge of all the other business services so that they can make referrals to other departments." The agency also employs a specialist IT Adviser so that the agency does indeed fulfil its aim of being a 'one-stop-shop' for business advice, both in terms of general business issues and of information and communications technologies. This is the aim of Business Links in general, but it is something which few have yet achieved due to their current lack of expertise in the area of ICTs. Like all Business Link specialists, the IT Adviser is recruited from the private sector and has many years of experience as a commercial manager.

According to the interviewee at Gloucestershire Business Link, the agency's advice to rural businesses wishing to invest in ICTs would always be to look at the process they want to change first: "Ask why you want to do that and how. Don't look to the technology as the solution until you have done the research into the other possibilities - then get independent advice *(for instance from a Business Link IT Adviser)*." On the whole, the service provided by Business Link Gloucestershire through the IT Vision Centre and the Computers in Business scheme is both comprehensive and promotional, encouraging small and rural firms to adopt ICTs for the benefit of their

business, while ensuring that potential adopters are first made aware of local suppliers of equipment and software.

Future approaches to ICT strategy

On the basis of agencies' current involvement in ICT strategies and the statements of interviewees, agencies' future work in relation to the business use of ICTs is likely to vary considerably across the study area. Certainly significant gaps in support exist, with many agencies perceiving the promotion and support of ICT use in local rural firms as the domain of other agencies or a concept which will need to be addressed at some time in the future.

Those agencies already actively supporting this area of business skills include Business Link Gloucestershire, the Telecottage Associations, ACE Computer Centre and WREN. All four consider the uptake of ICTs in rural businesses as essential to the future competitiveness of rural economies and all intend to continue and build upon the support work in which they have so far been engaged. They will continue to work in partnership with other local agencies, to try to ensure that more local businesses become aware of and receptive to the capabilities of new technologies where this is appropriate.

Other agency interviewees suggested that, although they believed ICTs to be of importance to their future work, they would be constrained by the availability and suitability of funding, particularly from Europe. For example, one aspect of TBAC's future strategy is to research and encourage technology transfer within Oxfordshire businesses, a project for which European funding has been secured in collaboration with Oxford Brookes University.

In the Warwickshire districts of the study area, ICT-related business support still lags behind that operating in Gloucestershire. This is not unexpected given the view expressed by the interviewee from the county's umbrella organization, Coventry and Warwickshire Partnerships (CWP). When asked if the partnership promoted the use of ICTs in rural areas or rural businesses, the interviewee revealed both the lack of

importance currently given to this area of business and the dependence of any future strategy on European funding.

> "Does the partnership promote the use of ICTs in rural areas or in rural businesses and, if so, how?"
>
> "Yes and no. It's not an obvious priority, but there's the government's ISI *(Information Society Initiative)* which will increase its profile. To kickstart that we funded an initial piece of research by the NREC for the bid for the DTI money (local colleges and WREN were also involved in this). If we succeed in winning the bid it will allow us to promote to businesses the importance of ICTs and we will be able to run courses on their use, etc. Some of this WREN does already, sometimes successfully, sometimes not."
>
> (Agency Interview 10, p.4.)

However, more positively, CWP is involved in the RegioNet project which is a "transnational European project aimed at promoting economic development and improving service provision ... through the creative use of information technology and telecommunications" (CWP, 1996, p.1). The project aims to enhance access to information for the public, businesses and students and involves a range of local service providers. The overall aim of the project is to form a basis for the development of the Information Society in the Coventry and Warwickshire sub-region, by establishing access points and kiosks and providing an on-line information service accessible to the public, businesses and students throughout the sub-region. The regional Information Society Initiative and RegioNet are strategic moves to get all Warwickshire's agencies working with a coherent approach to ICT implementation under the umbrella of CWP. However, since CWP sees its main remit as being one of attracting inward investment, it is probable that, again, the ICT-related needs of indigenous firms will not be given priority status.

The partnership recognizes a need for ICTs to occupy a more prominent role in future strategy and admit the omission of the issue from current strategy to be a problem:

> "The role of ICTs is mentioned in a very small way in the current strategy document. However, even as the ink was drying, we were thinking, 'Hang on a minute, this needs to be much more of a major element'. So it will be in the next document to be put out in 1997. We have made a commitment to promote an IT Strategy. Whether or not it is actually possible to do something like this is questionable. However, the profile of ICTs will certainly be raised in our future strategy and activities."
>
> (Agency Interview 10, p.6.)

In planning their future strategies, some agencies have researched the use of technologies in local businesses, but have failed to implement appropriate measures in response to the results obtained. For instance, Coventry and Warwickshire TEC carried out an employers' survey of 300 local businesses *(not sectorally specific)* in which the issue of information technology and telecommunications, particularly training, was raised frequently. The results of the survey showed that EFT was the most commonly used telematics application and that two thirds of the sample were using something which could be defined as telematic. The use of E-mail was found to be relatively high, but EDI was only used by 12% of businesses, most of these using it via the Internet. This led to a feasibility study into a proposal for an electronics park on the fringes of Coventry which would attract hi-tech businesses from throughout the UK and Europe. However, this does not assist existing businesses wishing to become more technologically advanced in their systems and procedures.

On the whole, agencies are, to varying extents and at various speeds, taking on the idea of promoting ICTs in rural businesses. This is now increasingly being driven by the government's Information Society Initiative (ISI), directed through the Department of Trade and Industry (DTI) via the medium of the Business Links and partnership organizations. However, comparison of the findings of the agency survey with the business survey suggests that many businesses will still stay ahead of the agencies. This is a direct result of the fact that their needs are increasing and developing with much greater urgency than is the agencies' realization of the central importance of ICTs to success in today's global marketplace.

7.5 Chapter summary

The findings of the analysis of agency approaches to ICTs in rural businesses may be summarized as follows:

1. There does not appear to be a specific *rural* development policy in the study area. Those agencies and local authorities active in the area believe a rural emphasis to be unnecessary as their current strategies inherently reflect the rurality of their respective locations. Some individuals do recognize the value of specificity, but this is not a prevailing view.

2. The lack of a rural focus is compounded by the fact that the mainstream agencies, such as the Business Links and the TECs, are not required to provide support to micro-businesses. Most businesses in the area fall into this size band and are thus slipping through the support networks. However, there is some sectoral targeting of support which is constructive.

3. There is little co-ordination between agencies and, while the creation of partnership bodies in recent years is seen as encouraging, their current strategic views generally lack the level of specificity necessary to co-ordinate implementation by their various constituent agencies.

4. There is a distinct lack of technical ICT-related knowledge and skills within agencies.

5. Much of the work of partnership bodies is directed towards encouraging inward investment. This has a double-edged detrimental effect on indigenous businesses: they lose out, firstly, by not being eligible for agency support and, secondly, they suffer from the effects of competition from incoming firms which are benefiting from favourable conditions set up as incentives.

6. Few agencies have integrated strategies in place which support or promote ICT uptake and use among their client businesses.

7. There is a mis-match between agencies' perceptions and their actions:
   a) It is widely recognized that ICTs will significantly affect the local economy, but agencies are not responding with appropriate measures to tap potential growth, nor to deal with potential problems.
   b) Agencies agree that there are three main barriers to firms adopting ICTs:
      i) financial
      ii) knowledge, and
      iii) training.

      However, many have so far failed to respond to these obstacles in the support which they provide.

8. There is a lack of specific incentives available for businesses to encourage them to invest in ICTs.

On the whole, the prevailing attitude towards ICTs, amongst all but a few of the surveyed agencies, does not prioritize the need for local businesses to be technologically aware in an 'Information Age'. This shows a lack of forward thinking on the part of these agencies, particularly since many of the businesses interviewed already use a range of advanced ICT equipment and services. The majority of these businesses have gone through the process of identifying their requirements and the most appropriate ways in which to fulfil these without any external impartial advice or assistance from the respective agencies. The agencies, on the other hand, are clearly lagging behind the businesses they are supposed to support in terms of their up-to-date knowledge of modern business systems and processes. The implications of these findings for future rural development policy and recommendations to policy makers are the subject of the final chapter.

Chapter 8

CONCLUSIONS AND IMPLICATIONS FOR RURAL DEVELOPMENT

8.1 Introduction

The convergence of information and communications technologies constitutes one of the most pervasive and influential forces in modern industrialized economies. These new technologies have precipitated structural changes in both the economy and society. This has resulted in the success of regions and local areas becoming increasingly dependent upon the creation, manipulation and distribution of information. Such changes present both opportunities and threats for regional and local economies, and for the organizations and businesses operating within them. Rural and peripheral areas are thought to be especially predisposed to the effects of ICTs due to their relative remoteness and the consequences of diversification of rural economies (Hepworth, 1989; Hudson & Parker, 1990; Grimes, 1992; Gillespie *et al.*, 1994; Ilbery *et al.*, 1995).

This research has been particularly concerned with the implementation of ICTs in rural businesses, exploring the patterns and processes involved in the uptake of ICTs and the potential effects of technology use on rural economic development. It is the purpose of this chapter to evaluate the main findings of the research and to examine their implications for rural strategists and policy makers. At this stage, the conceptual framework is also reviewed in the light of the findings related to ICT adoption decision-making processes within rural firms. Implications of the research are then addressed and policy recommendations put forward. Finally, some methodological issues arising are discussed and suggestions made as to directions for further related research.

Firstly, however, it is appropriate to reiterate the main aims of the research and to assess the degree to which they have been satisfied. The research was instigated on the basis of a recognized need to understand more fully the relationship between ICTs, *rural* businesses and *rural* development. This thesis thus examined present and likely future levels of uptake of new technologies and services in rural firms, exploring how these might benefit rural areas and how this could be assisted by policy. With this overall goal in mind, the research was designed to meet three specific aims:

1. to identify and account for current levels of use of ICT applications in rural businesses;

2. to determine the potential for further uptake of ICT applications among rural businesses in selected industrial sectors;

3. to assess the implications of business use of ICTs for rural planning and economic development.

These three have been largely satisfied in the preceding chapters. The three main themes of the research (ICTs, rural businesses and rural economic development) were defined and placed in the context of current debates on the role of technology in rural development (Chapters 1 and 2). They were then contextualized within the theoretical literature and a basis for the methodology was established (Chapter 3). The devised conceptual framework highlighted the importance of decision-making processes within the firm and identified the importance of factors, operating internal and external to the firm, in influencing ICT uptake and use (Chapter 4). Patterns of ICT adoption were identified (Chapter 5) and the main causal factors in the ICT adoption decision-making process were explored from the point of view of rural businesses and external agencies (Chapters 6 and 7). The potential for further uptake of ICTs by rural engineering and manufacturing firms was explored and important discrepancies between the perceptions of businesses and agencies were discovered, particularly relating to future levels of ICT uptake and the rural development implications of both current and future use (Chapters 6 and 7). In order to fully meet the third research aim, the preliminary assessment of agency advice and support (in Chapter 7) is now expanded in a discussion of the implications of the findings for key agents involved in policy and planning in rural areas.

8.2 The rural development impacts of ICT use in rural businesses

The results of each stage of the research were summarized throughout the thesis. However, these may be expressed as several major findings in relation to the specific aims of the research. This section highlights those considered crucial to informing future policy and planning in rural areas and discusses their implications.

1. Firms in the study area are diverse in terms of their technology use and requirements.

2. A range of factors, both internal and external to the firm, influences the uptake and use of ICTs in rural businesses; the most important of these is the extent and nature of customer and supplier networks.

3. The ICT-related needs expressed by businesses are not currently being met by local external agencies.

4. There is a mis-match between agencies' perceptions of ICT use in rural firms and their response to this area of business support; in the majority of agencies, the business use of ICTs has not yet become a key area of their work.

5. Significant levels of general awareness of ICTs exist among rural businesses, but the financial outlay involved in adopting these technologies remains a significant disincentive to small firms.

Diversity of firms in terms of technology use and requirements

Previous literature has tended to lend credence to the notion of a *rural economy* in which networks of producers and service providers co-exist with consumers within specific localities. The findings of this research suggest that, in all but a small number of cases, rural businesses are embedded within networks of customers and suppliers which reach far beyond their local area, thus discrediting the concept of a *rural economy*. In fact, in terms of the use of ICTs and technological requirements within the business processes, this research has revealed the existence of a *two-tiered economy*, characterized by *inward-looking* and *outward-looking* firms. Inward-looking firms generally produce more basic goods, buy from and sell to exclusively local businesses, organizations and individuals, have more limited technological requirements and make less use of ICTs. Outward-looking firms have more extensive, often international, linkages with other businesses and organizations, generally produce more technologically sophisticated goods and use more advanced ICTs. Furthermore, each of the firms involved in the in-depth study was found to be unique; this uniqueness applies to the particular circumstances under which they

operate, the way in which they currently use ICTs and the degree to which they genuinely require such advanced technologies.

Internal and external factors in ICT adoption decision-making: the importance of customer and supplier networks and entrepreneurial characteristics

The research examined the influences acting upon the decision-making processes leading to adoption or rejection of ICTs within the business. A wide range of interacting factors, both internal and external to the firm, was found to be important, to varying extents and in different ways. Again, the uniqueness of firms, in terms of the permutations of these factors, was clear.

Decisions about *whether or not to adopt ICTs* are most significantly influenced, in the case of many firms, by their relationship with large customers within the supply-chain. The demands of larger firms to whom they supply their products often dictate what ICT investments smaller businesses make and when, even down to exact software specifications. In the case of firms operating as part of a geographically dispersed group, internal (or pseudo-internal) factors related to communications needs between sites are crucial determinants of the level of technological penetration within the firm. However, other external factors, such as advisory agencies, appear to exert little or no influence on the ICT adoption decision-making processes in the firms surveyed. Few entrepreneurs expressed any significant knowledge of local agencies; fewer still have approached such bodies for advice, information or support. Some agency interviewees pointed out that this lack of prominence may be due to the fact that their funding often doesn't provide for the marketing and promotion of their services. However, findings suggest that some entrepreneurs perceive agencies as lacking credibility, questioning the ability and genuine business experience of agency employees.

In decisions about the *types* of solutions which should be applied to particular business problems, it is the characteristics of the key decision-maker/entrepreneur which are of most significance. Those entrepreneurs who have been through further or higher education are willing to take risks, have a reasonable level of technical knowledge, are methodical in their decision-making processes, and are more likely to see the development of an ICT

strategy as integral to their overall business plan. They also tend to use their technological resources more effectively.

The gap in agency support

The extensive survey showed that 68% of businesses in the study area are micro-enterprises, with ten or fewer employees. The fact that the agency survey revealed a clear deficiency in support targeted at this section of the business population is cause for real concern. In some cases, where technology penetration in a particular sector as a whole is substantial, the lack of awareness and uptake of ICTs among the smaller firms is likely to reduce their relative competitiveness in the medium to long term.

Related to this gap in support provision centred around smaller firms, the research has shown that external agencies exert much less influence on the decision-making processes of entrepreneurs and decision-makers in rural businesses than was presumed in the conceptual framework. Certainly, agencies are active at the local, regional and national levels, as proposed by the framework, but their impact on the businesses surveyed is minimal. Those external forces which are most potent originate from larger companies within the supply chain and from prevailing economic conditions.

The mis-match between agencies' perceptions and responses

Leaving aside those agencies which specialize in providing support and advice in the area of ICTs, most general business support agencies are both ill-informed as to current trends in ICT use by local businesses and unprepared to service the growing interest in new technologies among their clientele. The inadequacy of support is out of line with agencies' perceptions of current and future use of ICTs in local businesses, however, as most agree that ICTs will be vital to the future success of local economies. In spite of these views, many agencies are not getting actively involved in shaping their local *information* economy; rather, they are lagging far behind many of the local businesses to which they should be providing ICT support.

The main problem arising from this lack of expertise within agencies lies in the fact that ICTs are increasingly becoming an integral component in the whole range of business

solutions which might be implemented by entrepreneurs. Business support agencies must therefore be capable of providing reliable advice on holistic business solutions and practices. Without a working knowledge of current developments in ICTs and an understanding of the potential effects of their application, they are unable satisfactorily to fulfil this role.

Awareness of ICTs versus disincentives to their adoption: the need for action

Among those businesses surveyed, significant levels of *general awareness* of ICTs exist, but levels of *implementation* are still low, particularly among the smallest firms. This is particularly important, since any survey of this kind is likely to be somewhat biased towards those firms which have an interest in adopting such technologies or are already using ICTs. Thus, the actual levels of ICT use in the entire business population in the area can be expected to be even lower than is suggested by the survey results. In attempting to discover why these levels of adoption exist, this research suggests that the lack of support from agencies is an important factor. Businesses approached cited finance, knowledge and skills training as the three most significant barriers to ICT uptake. In all three areas, there is scope for agencies to develop the advice and support services they offer, but there is little evidence that this has yet begun in many of the agencies surveyed. Many interviewees in rural businesses expressed concern over the lack of impartial advice available to them in relation to ICTs; many knew of no sources of affordable training in the use of new technologies. Small firms are traditionally slow to innovate because of their resource limitations and the value placed on short-term payback on investment. If appropriate support is not provided, the role of small firms as the engine of economic growth is likely to fall at the first hurdle of the information age.

These findings provide a clearer insight into the origin and nature of factors influencing ICT adoption decision-making processes in rural businesses. On this basis, the conceptual framework proposed in Chapter 3 may be re-worked to incorporate this new information. The decision-making process may be considered to be operating within a dual environment which is both constraining and enabling in relation to ICT uptake. The complexity of these environments is represented in Figures 8.1 and 8.2.

Figure 8.1 The enabling environment in ICT adoption decision-making

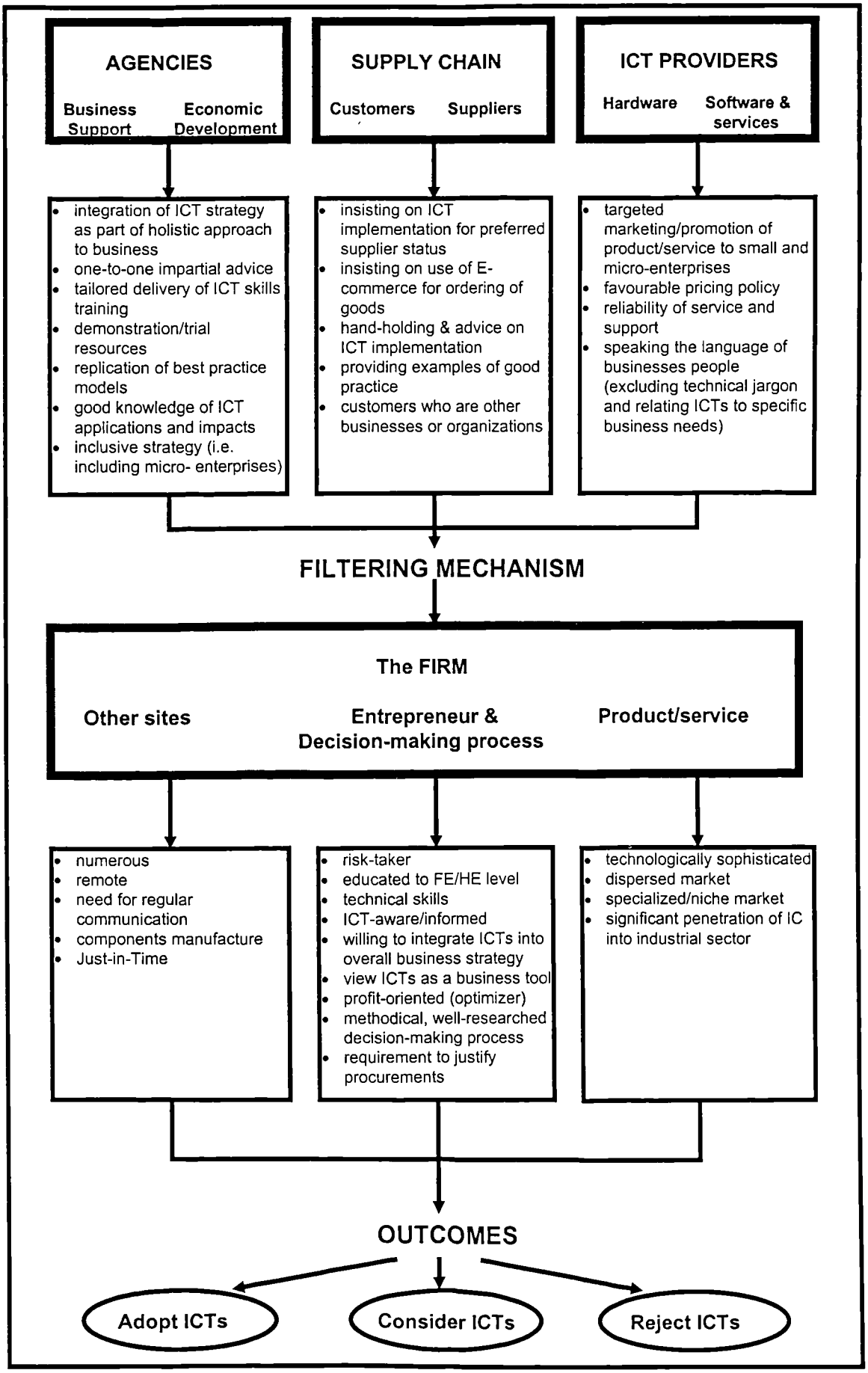
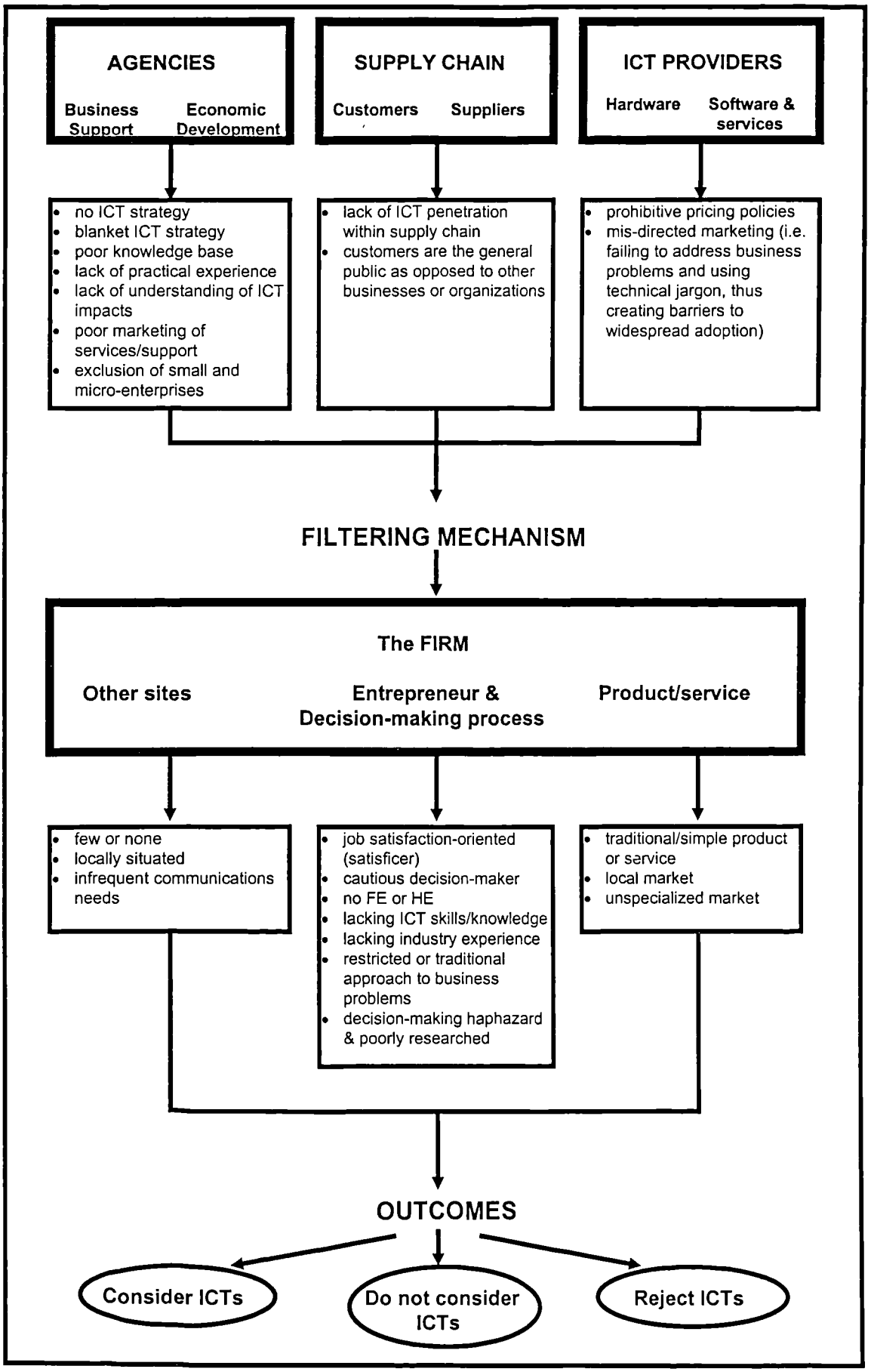


Figure 8.2 The constraining environment in ICT adoption decision-making



8.3 Implications for rural policy and planning

The research findings have a number of important implications for future policy and planning in rural areas. These are the subject of this section. However, it is first necessary to clarify the variation in ICT requirements among various business sectors. The research has shown that the individuality of circumstances means that firms are unique in their technology requirements. It is, therefore, of paramount importance that ICTs are not perceived to be essential to the growth and survival of all types of business. In fact, particular technologies may have relevance in only a relative minority of industrial sectors or individual businesses. ICTs are only appropriate in certain sectors and circumstances and it is *not* the case that all firms must adopt these technologies in order to survive.

This may be illustrated by those applications most widely used in commerce - i.e. EDI, EFT, E-mail, the Internet and videoconferencing. Only certain production processes can benefit significantly from electronic commerce such as EDI. There are threshold levels (or volumes) of production, below which electronic commerce is not a viable option. EDI is most useful in manufacturing and engineering firms supplying large customers, particularly on a just-in-time basis. EFT has most relevance for businesses with a strong retail element. Trading on-line via the Internet, on the other hand, is most effective in the case of niche products with specialized markets and, even here, it is doubtful whether a sufficient critical mass of users yet exists in the UK to make this method of marketing profitable. Products with internationally dispersed markets currently represent the most appropriate applications of this technology. Similarly, E-mail requires that a sufficient number of a firm's suppliers and/or customers are also networked and it is still in more widespread use within and between large public sector organizations and academic institutions. Videoconferencing is also still of limited use, appropriate only in those businesses where the majority of customer and/or supplier contacts are remotely located and require excessive amounts of directors' time and company money spent travelling to distant locations for meetings.

While it is important to emphasize that ICTs are not the solution to all the problems of rural businesses and their implementation does not represent an undisputed path to developing rural economies, it is also important to recognize that these technologies are

vital to the competitiveness and survival of *some businesses* in *some sectors*; it is thus crucial that supporting external agencies understand both their applications and their implications. The research findings suggest a number of recommendations for policy:

Policy and action must be specifically tailored to individual needs

The uniqueness of firms means that blanket policies, even for relatively limited areas, are inappropriate. A vast range of ICT solutions is now available for an almost infinite number of business problems. It therefore follows that agency support can only be truly effective if carried out on a one-to-one consultancy basis. The precise requirements of each individual firm must be diagnosed and specific solutions applied within a tailored support package which integrates the use of technology within the whole range of general business issues. Consequently, a locally-oriented approach to the general problems and specifically ICT-related needs of firms is required. Subsidiarity in future economic development strategy would allow such issues to be addressed from the 'bottom-up'.

The promotion of agencies' services must be more targeted

The general lack of awareness among rural firms regarding the services of their local support agencies was conspicuous. It follows that, if agencies are to make a noticeable contribution to the development of their local economies, they must more specifically market their services to local businesses. Three points are integral to this issue:

1. It is impossible to market something which does not exist; therefore, ICT-related support mechanisms must first be introduced (or existing support improved) before they can be promoted.

2. In the case of some firms whose ICT strategies are advanced and well integrated within the business, basic ICT support is inappropriate.

3. The funding regulations under which many agencies are financed currently do not provide resources for the marketing of their services to potential clientele. There is, therefore, a case for the conditions of funding to be adjusted accordingly.

Agencies must be aware of and respond appropriately to the real needs of local businesses

In an age of rapidly changing technology and increasing importance of this technology to business success, agencies need to be more technologically aware. Currently, most agencies call upon external experts and consultants to advise on technology-related matters. It is increasingly apparent that this type of support needs to be brought in-house; agencies need to employ ICT specialists in order to ensure that local businesses can benefit from the availability of new technologies on the basis of affordable and impartial advice. The research also shows that rural entrepreneurs/decision-makers respond more readily to advice given by those with business experience and so it is important that advisory agencies continue to recruit specialists from industry backgrounds.

Linked to this need is the fact that many rural entrepreneurs expressed concern over the lack of affordable training available to them. This represents another area where many support agencies are currently unable to satisfy the needs of local businesses. In order to exploit new technologies to the full, staff and managers alike must have adequate training in their application. Currently, the smallest firms are the least able to access such training due to cost and the tying up of staff time. If agencies were to make training more accessible to small businesses, this would alleviate some of the disincentives to ICT adoption which currently plague such a large proportion of the rural business population.

Innovative solutions are essential to ICT strategy

Finally, the research showed that significant levels of *general awareness* of ICTs exists among businesses surveyed. Agencies and policy makers need to build on this awareness by providing constructive means by which decision-makers and entrepreneurs in rural firms can take the next step and implement ICTs where this is appropriate.

Good examples of innovative solutions already exist and it is important that individual external agencies do not continually re-invent the wheel where the provision of ICT-related support is concerned. Existing solutions which have been proven successful in rural environments should be replicated by other agencies facing similar circumstances. The most obvious example to emerge from this research is that of Business Link

Gloucestershire's IT Vision Centre. This has been shown to deliver impartial advice from local suppliers to local businesses, thus satisfying many of the issues fundamental to encouraging sustainable rural economic development.

Furthermore, industry examples of the successful integration of ICTs (i.e. best practice) could be used by local economic development agencies to represent model business practices which can be replicated by other local firms with similar needs. This is not to suggest that such exemplar firms should be asked to divulge good practice to their competitors, but rather their experience could be drawn upon by other local firms in non-competing or complementary sectors. This would also promote an indigenous and sustainable means of encouraging rural economic development. Indeed, many individuals working in external agencies could also learn from models of good practice in industry.

8.4 Methodological issues arising from the research

During the course of this research, a number of methodological issues arose which warrant further consideration at this point:

1. The results suffer from an inherent bias towards larger firms, especially in the qualitative survey. Although every effort was made to ensure the representativeness of the survey across all size bands by using a variety of sources to locate firms for the study, there is no doubt that the *intensive* survey of rural firms is subject to bias. This is a direct result of the fact that the research topic is closely related to parameters such as firm size, because this dictates, firstly, the levels of resources available to invest in ICTs and, secondly, the likelihood that ICTs represent a requirement in the business. In addition, in order to understand the factors influencing the adoption of ICTs, the emphasis of enquiry must logically rest with adopters rather than non-adopters. This will introduce a bias towards larger firms since it is these which have so far been at the forefront of technology implementation.

2. The survey was unable adequately to represent those businesses which have suffered due to non-adoption of ICTs. There are two reasons for this. Firstly, those which have rejected new technologies will be much less likely to reply to the postal questionnaire

and those which do are less likely to agree to an interview as they do not believe they can make a valuable contribution to the research. Secondly, it is almost impossible, without local knowledge, to identify firms which have gone out of business, and still more difficult to determine to what extent their rejection of innovative technologies, such as ICTs, has contributed to their demise.

8.5 Implications for further research

This research has attempted to combine three main areas of academic enquiry (rural development, rural businesses and ICTs) from a new perspective. Employing a combined methodology, the work has examined empirically a considerable range of factors, both internal and external to the rural business, which influence decision-making processes with respect to ICT adoption. As such, this thesis represents a foundation upon which further research may be instigated.

The rapid development of new ICTs and the fluid nature of their applications in the business environment, means that this is a dynamic and stimulating area of enquiry. In the context of such vast opportunity for related work, and in the light of the limitations of the scope of this present research, there are a number of areas where future enquiry might be directed in response to the findings reported here. The following areas of work could contribute much to the fuller understanding of the manner in which ICTs are used in business and their wider economic consequences.

1. This research revealed the overriding importance of supply chain mechanisms in determining the nature of ICT uptake and use by rural businesses. The fact that this research only approached the relationship from the perspective of the 'supplier' business leaves an obvious gap in the knowledge about this association. Future work could usefully explore this issue from the perspective of the large customers of rural businesses; a more in-depth understanding of the dependency which is integral to such relationships could provide useful pointers for agencies whose remit involves the protection of the identity, independence and survival of smaller businesses in rural areas.

2. The conceptual framework proposed that the most important external influences acting upon rural firms would originate from the activities of local advisory and support agencies. Research findings suggest that this role is much less significant than expected. Further work should thus concentrate on those external factors which it was impossible to investigate within the scope of this thesis - namely the suppliers of ICTs, including suppliers of equipment and software, and Internet Service Providers (ISPs). The methods by which they market their products and services are likely to be important in shaping patterns of ICT adoption by rural businesses.

3. Finally, this research was limited to the investigation of factors influencing the adoption of ICTs by businesses located in an accessible rural area. Previous research (reviewed at length in Chapter 2) into the opportunities and constraints experienced by small businesses in non-rural areas indicates that many of the general problems faced by businesses occur independent of location. A comparative study of urban versus rural businesses, coupled with comparative research into businesses in different types of rural area could assess whether problems and impacts specifically related to the implementation of ICTs are generic to all small firms or to all types of rural area. A better understanding of the importance of location to technologies which are reputedly place-independent would assist national governments and agencies in improving accessibility to technology.

8.6 Concluding remarks

The impacts of ICTs in rural areas constitute a comparatively new area of research. This thesis has made an original contribution to existing literature by exploring a little researched area - that of the rural development implications of ICT use in rural businesses in selected industrial sectors. By incorporating a humanistic behavioural perspective and investigating the adoption process from the point of view of both rural businesses and rural economic development agencies, this work has bridged previously unexplored relationships. Clearly, many factors, both within the business and in the external environment, have been shown to be influential in producing patterns of ICT adoption and in affecting rural economic development. However, the uniqueness of individual firms, both in their external networks and relationships with other businesses and organizations and in the characteristics of the individual entrepreneurs within them, remains paramount.

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Appendix 1.1

ICT EQUIPMENT AND APPLICATIONS OF PARTICULAR RELEVANCE TO RURAL BUSINESSES

1. E-mail - Electronic mail - sending messages via computer and phone line. E-mail allows electronic messaging and sending of data files quickly and cheaply and has revolutionized business communications as it has several distinct advantages over postal and fax equivalents.
   a) E-mail is convenient as it can be sent at any time - the recipient does not have to be there to receive a message. Messages are stored until the recipient accesses them and thus global messaging across time zones is facilitated.
   b) E-mail is cost-effective for large mailings - it is as easy and cheap to send a single message to a large number of recipients as to an individual.
   c) E-mail is flexible, capable of sending large data files, word processed documents, spreadsheets or designs within the message
   d) E-mail is much faster than traditional means of communication, often immediate and certainly within a few hours
   e) E-mail messages can be sent anywhere in the world for the price of a local phone call by using a Service Provider (see entry on ISP) based within the local dialling area

2. EDI - Electronic Data Interchange - refers to "the exchange of structured trade data between computer systems of trading partners" and includes the transmission and receipt of invoices, purchase orders and credit notes (Preston, 1988, p.1). Its use is growing rapidly in supply chain industries, particularly in those where Just-in-Time manufacturing is prevalent.

3. EFT - Electronic Funds Transfer - allows computerized transfer of funds between bank accounts so that payments can be made directly (e.g. Switch card transactions).

4. Internet - the global network of computer networks to which an estimated 40 - 60 million people are connected. The Internet is a vast searchable store of information over which E-mail can be sent and goods and services bought and sold. Although its origins lie in academic and research institutions, its use in the business environment is growing rapidly.

5. ISDN - Integrated Services Digital Network - fibre optic telephone lines which allow much faster transmission of greater amounts of data than standard telephone lines. Essential for videoconferencing ISDN lines support the simultaneous transmission of voice, text, images and data, and up to eight separate devices at once.

6. LAN - Local Area Network - a network allowing communication between computers, within a company or organization, so that resources such as peripherals (e.g. printers) and software may be shared across the network. LANs usually connect computers on a single site, but in the case of multi-site companies, may extend to connect branch plants to the head office. LANs are used particularly for electronic message within organizations.

7. Modem - abbreviation of modulator/demodulator - a device which converts analogue data into digital data and vice versa, allowing computerized data to be transferred over telephone lines.

8. Teleworking - working remotely from an employer, customer or client using technology to communicate (e.g. via phone, fax, computer, E-mail, etc.).

9. Videoconferencing - allows transmission of voice, data and video images (via ISDN) for 'meetings' between individuals or groups of people located remotely.

10. WWW - World Wide Web - the graphical user interface which allows the user to search for information stored on the Internet using browsing software. The WWW provides a seamless interface across the Internet so that the user does not have to log into the various networks of which the Internet is composed. The business use of the WWW is now also growing rapidly.

Appendix 4.1
POSTAL QUESTIONNAIRE:
RURAL MANUFACTURING AND ENGINEERING FIRMS

Information Technology and Telecommunications in Rural Businesses: Survey of Applications and Uses

The Business

Business Name
Address 1
Address 2
Village
Town
County Postcode

If any of the above details are incorrect, please make amendments as necessary.

1. Name of Respondent _____
Position within the Firm _____

2. Is this firm ...
(a) owned by an individual or family? ☐
(b) owned by a group of people who are not related (i.e. partners or shareholders)? ☐
(c) under another type of ownership (please specify)? ☐
_____
(Please tick the relevant box.)

3. Is this site the only place from which this firm trades?
Yes ☐ No ☐

If no ...
(i) Where are the other sites? _____
_____
(ii) At which site is the headquarters of the firm? _____

4. When did this firm start up? _____

5. When did this firm begin operating from this site?_____

The following questions are concerned only with the operation of the firm at this site.

6. Please describe the principal product(s) and/or service(s) provided at this site.
_____
_____
_____

7. How many people are regularly employed here ...
(a) full-time? _____
(b) part-time? _____

8.(a) Since November 1993, has the workforce ...
(i) expanded? ☐
(ii) contracted? ☐
(iii) remained the same? ☐
(Please tick the relevant box.)

(b) In the next year, do you expect the workforce to ...
(i) expand? ☐
(ii) contract? ☐
(iii) remain the same? ☐
(Please tick the relevant box.)

9. Which of the following business functions take place at this site?
(Please tick all that apply.)

- Accounting ☐
- Administration ☐
- Manufacturing/production ☐
- Marketing ☐
- Provision of a service (to be sold to external customers) ☐
- Repairs &/or maintenance ☐
- Research, design & development ☐
- Retailing ☐
- Transport & distribution ☐
- Warehousing &/or storage ☐
- Wholesaling ☐
- Other business functions (please specify) ☐

_____

10. (a) Who are this firm's ***principal*** customers? (Please tick all that apply.)
(i) the general public within a 20 mile radius ☐
(ii) the general public throughout the United Kingdom ☐
(iii) the general public throughout the United Kingdom and abroad ☐
(iv) other businesses/organizations within a 20 mile radius ☐
(v) other businesses/organizations throughout the United Kingdom ☐
(vi) other businesses/organizations throughout the United Kingdom and abroad ☐

(b) If (iv), (v) or (vi), please indicate ***how many*** other businesses/organizations are ***principal*** customers?
1 ☐ 2-5 ☐ 6-10 ☐ >10 ☐

(c) If your principal customers are in a particular place, please specify ...

_____

11. **(a)** How many firms supply goods and/or services to the firm at this site on a regular basis?

1 ☐ 2-5 ☐ 6-10 ☐ >10 ☐

(b) Where are ***most*** of these firms situated? (Please tick all that apply.)

(i) within a 20 mile radius ☐
(ii) throughout the United Kingdom ☐
(iii) throughout the United Kingdom and abroad ☐

The following questions refer to the use of information technology and telecommunications by the firm at this site.

12. Which of the following pieces of equipment does the firm have at this site? (Please tick all that apply.)

- Telephone ☐
- Fax ☐
- Ansaphone ☐
- Mobile phone ☐
- Pager ☐
- Desk-top computer ☐
- Lap-top (portable) computer ☐
- Modem *(a device which facilitates transmission of computerised data via telephone network)* ☐
- EFT (Electronic Funds Transfer) facility *(for 'swipe' reading credit/charge cards)* ☐
- Video conferencing facility *(for holding meetings via a television link)* ☐
- Videotex *(for accessing data via a television link)* ☐
- Cable television: *for remote shopping* ☐
  for interactive business use ☐
- Private wire/leased line *(a telephone line hired for the exclusive use of the firm)* from:
  British Telecom ☐
  Mercury ☐
  Energis ☐
  Other (please specify below) ☐

  _____

- ISDN (Integrated Services Digital Network) link *(a telephone service which allows high speed, high quality transmission of voice, images and text)* ☐
- CD-Rom Drive *(can read and store large quantities of data on compact disks)* ☐
- Optical bar-code reader
- Scanner *(a device which reads text and graphics into a computer)* ☐
- LAN (Local Area Network) *(a computer network within the company)* ☐
- Satellite terminal for business use
- Other (please specify below)

  _____

If the firm has a computer (either a desk-top or a lap-top) please answer all the following questions. <u>If not, omit question 13 and answer questions 14 and 15.</u>

13.(a) Please indicate the type of computers which are available at this site.
(Please tick all that apply.)

- IBM compatible personal computer ☐
- Apple Macintosh ☐
- Mainframe computer ☐
- Other (please specify) ☐ _____

(b) For which of the following purposes is the computer used?
(Please tick all that apply.)

- Word processing ☐
- Electronic mail ☐
- Financial management/book-keeping ☐
- Producing accounts ☐
- Generating business information for use by management ☐
- Desk-top publishing (production of documents to publication standard) ☐
- Controlling the manufacture of products ☐
- Design and development of products ☐
- Other uses (please specify) ☐

(c) Please indicate the main software used by the firm.

_____

_____

14. Which of the following telecommunications/information technology services are you ***aware of***, ***currently using*** and/or think you ***may need*** in the next two years? (Please tick all that apply.)

	Aware of	Currently using	May need
. EFT *(transferring funds electronically, by a computer or by swipe reading of credit/ charge cards)*	☐	☐	☐
. EDI *(Electronic Data Interchange - exchanging data via a computer link)*	☐	☐	☐
. E-mail *(Electronic mail - sending messages via a computer link)*	☐	☐	☐
. Teleconferencing *(holding meetings via a telephone link)*	☐	☐	
. Teleworking *(working remotely via a telephone and/or computer link)*	☐	☐	
. Teleshopping *(buying and/or selling goods via a television link*	☐	☐	☐
. Videoconferencing *(holding meetings via a television link)*	☐	☐	
. Videotex *(accessing data via a television link)*	☐	☐	
. Other services (please specify below)	☐	☐	

_____

15. Finally, to whom do you turn if you need advice on information technology and/or telecommunications? _____

_____

_____

****

Thank you very much for taking the time to complete this questionnaire. Your answers will be extremely valuable in my research and will be treated with strict confidentiality.

Appendix 4.2

CODING SCHEME APPLIED TO DATA FROM EXTENSIVE SURVEY

Key to abbreviations used:

CODE	DATA FORMAT
N	numeric
AN	alphanumeric
TXT	textual data only
copy text	text of response entered directly
none	response not coded (entered directly)
year	year is entered in format 19XX
*	0 = no answer 1 = yes 2 = no 9 = not applicable
#	0 = no answer 1 = aware of 2 = currently using 3 = may need 4 = aware of and currently using 5 = aware of and may need 9 = not applicable

Question	Codename	Type	Description	Coding
	business	TXT	name of business	copy text
	add1	TXT	first line of address	copy text
	add2	TXT	second line of address	copy text
	village	TXT	name of village	copy text
	town	TXT	name of town (or nearest large town)	copy text
	county	TXT	name of county	copy text
	pcode	AN	post code	copy text
1	resp	TXT	name of respondent	copy text
	position	TXT	position of respondent within the firm	copy text
2	own	N	ownership	1=owned by individual or family
				2=owned by group of people not related
				3=other type of ownership
				4=partnership
	owntype	N	type of ownership (if other)	
3	siteonly	N	only site from which firm trades?	*
	siteoth	TXT	location of other sites	copy text
	sitehq	TXT	location of headquarters of group	copy text
	hq	N	location of headquarters of group	1=here
				2=elsewhere in the UK
				3=elsewhere in Europe (outside the UK)
				4=outside Europe
4	startup	N	year of startup (e.g. 1991)	none
	age	N	age of firm	coded
5	startop	N	year business started operating at this site	year
6	sic	N	Standard Industrial Classification number	none

	sic1	N	first digit of SIC number	2=minerals
				3=engineering
				4=manufacturing
				5=construction
				6=distribution
				8=finance
				9=others
	sic2	N	first digit of SIC number = 3 or 4?	*
7	empft	N	full-time employees	none
	emp1	N		coded
	emppt	N	part-time employees	none
	emp2	N		coded
8	wkfrcel	N	workforce change in the last year	1=expanded
				2=contracted
				3=remained the same
	wkfrcen	N	workforce changes predicted next year	1=expanded
				2=contracted
				3=remained the same
9	funno	N	number of business functions performed	none
	funno2	N	number of business functions performed	coded
	funacc	N		*
	funadmin	N		*
	funman	N		*
	funmkt	N		*
	funserv	N		*
	funmain	N		*
	funrdd	N		*
	funret	N		*
	fundist	N		*

	funstor	N		*
	funwsal	N		*
	funoth	N		*
10	custgpt	N		*
	custgpuk	N		*
	custgpab	N		*
	custbot	N		*
	custbouk	N		*
	custboab	N		*
	custprin	N	number of principal customers	1=1
				2=2-5
				3=6-10
				4=more than 10
	custplac	TXT		copy text
11	suppno	N		1=1
				2=2-5
				3=6-10
				4=more than 10
	suppsit	N		1=within 20 mile radius
				2=throughout the UK
				3=throughout the UK and abroad
12	eqttph	N		*
	eqtfax	N		*
	eqtaph	N		*
	eqtmph	N		*
	eqtpager	N		*
	eqtdt	N		*
	eqtlt	N		*
	eqtmode	N		*

	eqteft	N		*
	eqtvconf	N		*
	eqtvtex	N		*
	eqtcabrs	N		*
	eqtcabbu	N		*
	eqtpwbt	N		*
	eqtpwm	N		*
	eqtpwe	N		*
	eqtpwoth	N		*
	eqtisdn	N		*
	eqtcdrom	N		*
	eqtoprdr	N		*
	eqtscan	N		*
	eqtlan	N		*
	eqtsat	N		*
	eqtoth	N		*
13	comptype	N		1=IBM compatible personal computer
				2=Apple Macintosh
				3=Mainframe computer
				4=Other
	compwp	N		*
	compelm	N		*
	compbkg	N		*
	compacct	N		*
	compinfo	N		*
	compppub	N		*
	compman	N		*
	compdd	N		*
	compoth	N		*
	compsw	TXT		copy text

14	serveft	N		#
	servedi	N		#
	servelm	N		#
	servtc	N		#
	servts	N		#
	servvc	N		#
	servvt	N		#
	servoth	N		#
15	advice	TXT	sources of advice used	copy text
	seqt	N	number of pieces of equipment	sum of 'eqt' columns equal to one
	scompfn	N	number of computer functions used	sum of 'comp' columns equal to one
	saware	N	number of telematics services aware of	sum of 'serv' columns equal to 1 & 4 & 5
	susing	N	number of telematics services using	sum of 'serv' columns equal to 2 & 4
	sneed	N	number of telematics services may need	sum of 'serv' columns equal to 3 & 5

Appendix 4.3
INTERVIEW SCHEDULE:
RURAL MANUFACTURING AND ENGINEERING FIRMS

Telematics and Rural Businesses
an evaluation of implications for rural development
Manufacturing and Engineering Firms - Interview Schedule

I The Firm

i. ownership:
more detail on this - e.g. who in the family owns the firm?
how many partners/shareholders are there?

ii. business functions:
check details

iii. operations:
how are the various business operations split between the various sites?
problems? benefits? solutions? telematics?

iv. the workforce:
gender balance? skills levels? recent changes?
seasonal variation? associated problems? solutions? telematics?
proportion local (from the village or from within a 10 mile radius)?

v. evolution:
major changes to the firm since its start-up? changes (particularly to products/services provided, mode of production, workforce (size & type), organizational structure, functions/operations, etc.)
main problems facing the firm at the present time?

vi. customers and suppliers:
communicating with business customers? associated problems? solutions? telematics?
customer base adequate? ways of increasing it? telematics?
main suppliers? what do they supply?
communciation with suppliers? associated problems? solutions? telematics?
supplier network adequate? ways of increasing it? telematics?

vii. information technology and telecommunications (telematics)

(a) use of telematics equipment and services:
specific details and uses? when acquired?
benefits expectec? actual benefits? worthwhile investment?
major problems in using the equipment? how solved?
up-to-date or out-of-date now? feel need to update it in the near future?
significant improvements to the general dy-to-day running of the firm?
improvements to the execution of particular procedures?
far-reaching effects (beneficial or otherwise) on the local rural community?

(b) telematics equipment and services needed in the future:
explore future needs and investment plans

II The Decision Maker

i. making decisions:

(a) rural location

why was the business set up here?
why did the firm move here? conscious decision to be in a rural area?
opportunities or constraints due to location in a rural area? & in this particular rural area?
what effects does the firm have in the local rural community?

(b) telematics equipment and services

who is involved in the decision-making?
is there a set procedure for making such decisions?
what are the most important factors when investing in telematics equipment or services?
who has ultimate control over finance available for telematics procurements?
is this a major constraint on the decisions which are made?
advice? where from? how useful has this advice been in the past?

ii. personal characteristics of the decision-maker:

if informant is the key decision-maker or a key player in the decision-making process, ask about their persoanl details - otherwise ask them about the details of the decision-maker or major players in the decision-making process
e.g. originally from this area or another rural area? educational background? qualifications? business experience (how long in this industry/in this firm?), technical & business skills, training, marital status (& dependants)

iii. the effects of personal characteristics on decision-making:

do you consider yourself to be a risk-taker? *(explore informant's reasons for answer and relationships between his/her responsibilities and the level of risk he/she is likely to take - also compare, if necessary, risk-taking behaviour in general business decisions with level of risk taken in telematics decisions)*

iv. personal opinions and attitudes (on telematics and rural development):

personal views on the usefulness of telematics in the business environment (particularly in smaller businesses and in rural businesses)?
what do you inderstand byu the term "rural development"?
do you think that the use of telematics in a rural firm such as this can have effects on the development (i.e. improvement of the social and economic well-being) of a rural community?
do you think that any benefits or disadvantages have accrued to the local rural community as a direct result of this firm's use (or non-use) of telematics technology?
do you think that any of these might have occurred regardless of whether or not this firm was using telematics?

v. the future:

in what ways do you envisage the firm developing in the future?
possible future role of telematics?

Appendix 4.4

CATEGORIZING OR UNITIZING THE DATA

Broad themes	Units of meaning
ownership	workforce historical background splitting of operations
the product made	splitting of operations customer service
location of other sites	product range company strategy the future
problems associated with geographic dispersal of sites	ICT use
solutions to the problems associated with geographic dispersal of sites	ICT use evolution/historical background company policy personal attitudes/opinions of decision-maker
historical evolution of the firm (including major changes)	issues of rurality problems of split location splitting operations company policy personal views of decision-maker service top customers competition contact/interaction with customers the future interviewee's job product range problems solutions effect of firm on local community rural location
workforce	skills training personal views/goals problems of location in a rural area skills levels within the firm personal views on women's attitudes to work importance of manufacturing in the economy personal views on the government IT benefits of firm to local community product range customers - who and how many
skills training within the firm	IT use customer relations/interaction structure of the firm personal views and goals the future

Broad themes	Units of meaning
ICT equipment used and why	links with other sites product range the future company's ICT strategy IT skills within the firm personal opinions company policy (with respect to training) problems of compatibility between sites and systems interviewee's job
telematics services used and why	workforce links between sites personal opinions customer links supplier links the future
product range	customers - who are they?
decision-maker (personal characteristics, education, employment history decision-making	ICT use and training within the firm personal views on technology use role of interviewee in community interviewee's personal outlook personal goals employment experience educational background how learnt IT skills
personal skills/education of entrepreneur/decision-maker	company attitude to education and skills training
the rural location - benefits and drawbacks	the workforce
rural development and ICTs	personal views effects on local community of using ICTs
effects of the firm's ICT use on the local community	company strategy training within the firm personal opinions the workforce
the future	competition effects of technology on local community
the future as it relates to ICT use within the firm	personal opinions personal experience/employment history
customers	who are they? communication with customers number, type and location of customers
suppliers	who are they? communication with suppliers number, type and location of suppliers
use of sources of advice and information on ICTs	

Appendix 4.5

INTERVIEW SCHEDULE:

EXTERNAL AGENCIES

Information and Communications Technologies in Rural Businesses: an evaluation of implications for rural development
Survey of Agencies and Organizations

I The Agency/Organization

1. Name of agency/organization
2. Address of agency/organization
3. Position of interviewee within the agency/organization
4. Year of start-up
5. Public or private sector, how is the agency/organization funded and what is the annual turnover/budget?
6. How is the agency/organization structured?
7. How many staff are employed by the agency/organization?
8. Mission statement
9. Primary functions
10. Secondary functions
11. What geographical area is covered by this office/branch of the agency/organization?
12. Are there any other offices/branches which serve the study area - South Warwickshire and parts of Gloucestershire and Oxfordshire?

II Policies

Rural Economic Development

1. Does the agency/organization have a rural economic development policy?
2. If so - what is this policy? *(ask if there is any relevant policy documentation available)*
3. How is the policy targeted and to whom? *(i.e. blanket approach or differentiated)*
4. How is policy information disseminated to the target population?

Rural businesses

5. How could the agency/organization help to promote rural economic development through the medium of rural businesses *(for example grants, buildings, enabling measures, organization, information, training)*?

6. How does the agency/organization help rural businesses?
7. What types of businesses are involved *(i.e. are there defined limits as to the type of business, the age of business or the size of business which may be helped)*?
8. Can you provide any examples of rural businesses which have benefited directly from the activities of the agency/organization?
9. How do you monitor the success of such activities and their wider impacts?

ICTs in Rural Businesses

10. To what extent are advanced Information and Communications Technologies (ICTs) an element of the agency/organization's current rural economic development policy?
11. Does the agency/organization promote the use of ICTs in rural areas or in rural businesses *(and if so, how)*?
12. Does the agency/organization work in conjunction with any other body/ies with regards to the promotion of rural development, rural businesses or ICTs in rural areas *(if so, what is the nature of the relationship(s) - e.g. policy-based, financial, advisory)*?

III Perceptions

1. What is the agency/organization's perception of the current level and types of economic activity in the local rural area?
2. What levels of ICT adoption and use are perceived by the agency/organization to exist within local rural businesses?
3. What are the barriers working against rural business entrepreneurs wishing to take-up new ICTs?
4. What are the incentives for rural business entrepreneurs wishing to take-up new ICTs?
5. What would be the agency/organization's advice to a rural business entrepreneur wishing to invest in new ICTs?
6. What are the agency/organization's views regarding the potential impacts of the use (and non-use) of advanced ICTs in local rural businesses? *(with respect to the firm and the local rural community)*
7. What are the agency/organization's perceptions of the current trends in the uptake of ICTs by rural businesses?
8. What are the perceived implications of these levels of uptake in terms of the economic development of the local rural area?

IV Future policy initiatives

1. How does the agency/organization intend to promote the economic development of the local rural area in the future?
2. What will be the role, in future policy initiatives, for the promotion of the use of advanced ICTs, particularly in rural businesses?
3. What could be done to improve the uptake of ICTs among rural businesses?
4. Would this be seen as desirable by the agency/organization?

V Further information or comments

1. To what extent does the agency/organization itself use ICTs?
2. Are there any other aspects regarding ICTs, rural businesses and rural development which have not already been covered and which you feel are appropriate to this research/discussion?

Appendix 5.1

The re-working of published UK SIC Codes to create new codes shown in Table 5.3. Sample of format in which codes are published:

ENGINRG 3

Order Group	Description
31645	Other packaging products of metal
31650	Domestic heating and cooking appliances
31661	Metal furniture
31662	Safes, etc.
31670	Domestic and similar utensils of metal
31691	Locks, etc.
31692	Needles, pins: small metalware
31693	Base metal fittings, builders
31694	Miscellaneous finished metal products not elsewhere specified
32041	For buildings
32042	For civil engineering works
32051	Boilers and boilerhouse plant
32052	Process plant fabrications
32053	Other heavy fabricated steelwork in plate
32111	Soil prep. and cultivating machinery
32112	Harvesting and threshing machinery
32113	Dairy feed processing and other agricultural machinery
32120	Wheeled tractors
32211	Metal cutting machine tools
32212	Metal forming machine tools

MANUFACT 4

Order Group	Description
45600	Fur goods
46101	Sawn wood
46102	Planed wood
46201	Semi-finished wood products
46202	Preservation/treatment of wood
46300	Builders' carpentry and joinery
46401	Wooden boxes, crates, etc.
46402	Cooperage
46500	Other wooden articles (excluding furniture)
46630	Brushes and brooms
46641	Cork and cork articles
46642	Basketware, wickerwork, etc.
46711	Upholstered furniture
46712	Other wooden domestic furniture
46713	Non-domestic wooden furniture
46714	Wooden cabinet work, etc.
46715	Beds and mattresses
46720	Shop and office fitting
47101	Pulp
47102	Newsprint

Source: Dun & Bradstreet Ltd.

Conversion to tailored code numbers for the purposes of categorization of firms surveyed:

1. The first two digits of the published codes were noted, resulting in a list of numbers as follows (for the coded groupings given in the tables above).

31 small metal products such as furniture, fittings and locks

32 large and complex metal products such as machinery and components

45 clothing, footwear and household textiles

46 wood and wood products

47 pulp, household paper, printing and publishing

2. These two digit codes were amalgamated into new groups of similar products as shown below. SICBKDN (SIC breakdown) and SICSUMM (SIC summary) are the variable names used in the database. Single digit SICSUMM codes are used for engineering product groups in order to distinguish them quickly from manufacturing products.

SICBKDN	SICSUMM	Description
30	1	engineering products not elsewhere specified
31, 32	2	metal goods & heavy machinery & equipment
33, 34	3	electrical & electronic goods & equipment
35, 36	4	motor & other vehicles (engines, bodies & parts)
37	5	measuring checking & precision instruments & equipment
40, 49	11	manufactured goods not elsewhere specified
41, 42	12	food & drink
43, 44, 45	13	fibres, fabrics, textiles & leather (inc. household & clothing)
46	14	wood & wood products
47	15	paper, printing and publishing
48	16	rubber & plastics

Appendix 5.2

Tables showing detailed figures for individual items of IT, T & T equipment available at firms surveyed cross-tabulated with the location of customers. (Note: In the tables, percentage figures are as percentages of 130 firms.)

Fax

	Yes		No		No answer		Total	
	no.	%	no.	%	no.	%	no.	%
only local	16	12.3	12	9.2			28	21.5
elsewhere in the UK	26	20.0	3	2.3			29	22.3
local and elsewhere in the UK	11	8.5	5	3.8			16	12.3
elsewhere in the UK & abroad	47	36.2	1	0.8			48	36.9
local, elsewhere in the UK & abroad	6	4.6	2	1.5			8	6.2
no answer	1	0.8					1	0.8
	107	82.3	23	17.7			130	100.0

Desk-top Personal Computer

	Yes		No		No answer		Total	
	no.	%	no.	%	no.	%	no.	%
only local	12	9.2	16	12.3			28	21.5
elsewhere in the UK	21	16.2	8	6.2			29	22.3
local and elsewhere in the UK	9	6.9	7	5.4			16	12.3
elsewhere in the UK & abroad	42	32.3	6	4.6			48	36.9
local, elsewhere in the UK & abroad	5	3.8	3	2.3			8	6.2
no answer			1	0.8			1	0.8
	89	68.5	41	31.5			130	100.0

Modem

	Yes		No		No answer		Total	
	no.	%	no.	%	no.	%	no.	%
only local	1	0.8	27	20.8			28	21.5
elsewhere in the UK	8	6.2	21	16.2			29	22.3
local and elsewhere in the UK			15	11.5	1	0.8	16	12.3
elsewhere in the UK & abroad	26	20.0	22	16.9			48	36.9
local, elsewhere in the UK & abroad			8	6.2			8	6.2
no answer			1	0.8			1	0.8
	36	26.9	94	72.3	1	0.8	130	100.0

Electronic Funds Transfer (EFT) Facility

	Yes		No		No answer		Total	
	no.	%	no.	%	no.	%	no.	%
only local	1	0.8	27	20.8			28	21.5
elsewhere in the UK	3	2.3	26	20.0			29	22.3
local and elsewhere in the UK			15	11.5	1	0.8	16	12.3
elsewhere in the UK & abroad	8	6.2	40	30.8			48	36.9
local, elsewhere in the UK & abroad			8	6.2			8	6.2
no answer			1	0.8			1	0.8
	12	9.2	117	90.0	1	0.8	130	100.0

Integrated Services Digital Network (ISDN) Line

	Yes		No		No answer		Total	
	no.	%	no.	%	no.	%	no.	%
only local			28	21.5			28	21.5
elsewhere in the UK	3	2.3	26	20.0			29	22.3
local and elsewhere in the UK			15	11.5	1	0.8	16	12.3
elsewhere in the UK & abroad	6	4.6	42	32.3			48	36.9
local, elsewhere in the UK & abroad			8	6.2			8	6.2
no answer							1	0.8
	9	6.9	119	91.5	1	0.8	130	100.0

Video-conferencing Facility

	Yes		No		No answer		Total	
	no.	%	no.	%	no.	%	no.	%
only local			28	21.5			28	21.5
elsewhere in the UK			29	22.3			29	22.3
local and elsewhere in the UK	2	1.5	13	10.0	1	0.8	16	12.3
elsewhere in the UK & abroad	1	0.8	47	36.2			48	36.9
local, elsewhere in the UK & abroad			8	6.2			8	6.2
no answer			1	0.8			1	0.8
	3	2.3	126	96.9	1	0.8	130	100.0

Appendix 7.1

SWOT ANALYSES FOR THE STUDY AREA

SWOT Analysis for Oxfordshire

STRENGTHS	WEAKNESSES
• some world class businesses • major high-tech/R & R sectors • focal point for tourism • high attainment in education and training • high quality of life/environment • good transport/communication links • comparatively low/falling unemployment levels • strong local partnerships • education/business links • strategic alliance of FE Colleges • higher education institutions • no single dominant employer	• few unifying issues • fragmented identity within the county • unemployment blackspots • unchanging level of long term unemployment • decline in employment in rural industries • lack of measures to assess impact of actions • level of training by small businesses
OPPORTUNITIES	**THREATS**
• promote innovation/R & D • development of land and commercial property to attract and retain high added value businesses • develop tourism, R&D, motor vehicle and printing & publishing potential • exploit Oxford as internationally recognized name • further enhance education/business links • building on New Business Agenda to encourage investment in existing businesses • development of Business Link • Funding from EU • increasing impact of regional government offices • growth of businesses in 20-199 size band	• global competition • regional/national competition • skill supply mismatch • short timescale reductions in employment levels of 200+ organizations • reducing traditional job opportunities for men • reducing long term employment opportunities • inappropriate inward investment • substantial directional shift in government policy related to economic development

Source: HOETEC (1996) p.11.

SWOT Analysis for Gloucestershire

STRENGTHS	WEAKNESSES
• availability of high quality technical skills within workforce • highly accessible location within easy reach of important UK markets, ports & airports & local suppliers • attractive natural environment supported by towns & villages in which residents can enjoy a high quality of life • well established education & training infrastructure & private sector firms who are committed to training & improving links with schools • proven ability to develop & apply technologies successfully for effective commercial use • employment sectors with good growth potential, e.g. tourism, medical equipment/services, food • high profile of 'Investors in People' • strong tradition of aerospace & defence engineering production	• weak external image • impression that the county is 'full-up' • county does not qualify for selective government or EU development funds • no university • over-dependence on defence industry in a climate of reducing defence expenditure • the focus of Europe is shifting eastwards • poor communication links west of the River Severn
OPPORTUNITIES	**THREATS**
• export oriented economy • tourism • strong partnership ethos • competitively priced land & premises within the West region • large and small quality sites available in a variety of locations • one of the largest sites in this part of the UK with immediate motorway access • strong development agency network (WEDA, GDA) • Rural Development Area Programme in the Forest of Dean District • available pool of skilled engineers arising from the down-sizing of the defence industries • access to competitive funding, e.g. KONVER, SRB, etc.	• overshadowed by major centres of Bristol and Birmingham • threat of continuing cuts in defence expenditure • in close proximity to, & in competition with, areas which attract mainstream government & EU funding • potential mismatch between demographic changes & employment opportunities • decisions on the future of some local firms in the hands of decision-makers outside the county/country • potential 'shake-out' in labour intensive financial services sector • shortage of sufficient sites to satisfy immediate/short-term demand • potential mismatch between the demands made by business for sites, their availability & environmental constraints • decline in the availability of high quality technical skills

Source: Gloucester Chamber of Commerce and Industry (1996) pp.9-10.

SWOT Analysis for Coventry and Warwickshire

STRENGTHS	WEAKNESSES
• attractive location for distribution due to centrality on UK major road (M1, M40, M42, M69, M6) and rail networks, giving ready access to markets and suppliers • close to Birmingham International Airport, the NEC and access to London, South East and Europe • higher than average business formation in 80s and 90s reflecting strong enterprise culture • particular capability in engineering, manufacturing, industrial design/design engineering (esp. Automotive, IT, aerospace and electrical/power industries) • skilled and flexible workforce • good links between industry and education sector (esp. Two universities with specialisms relevant to business development, international excellence and economic regeneration) • outstanding tourism facility offering quality natural environment, internationally renowned historic/cultural heritage • attractive location as national centre for financial services	• over-dependence by network of local suppliers (specifically to the components sector) on a small number of large manufacturing companies • changing patterns of employment leading to instances of rural deprivation where access to job opportunities is limited • large manufacturers shedding staff - 21,000 manufacturing jobs lost between 1984 and 1991
OPPORTUNITIES	**CHALLENGES**
• R & D infrastructure investment to build on existing international excellence • new International Manufacturing Centre at Warwick University will be leader in Europe • local FE and HE institutions providing a range of support services to employers • potential for growth in the service sectors supported by European direct freight facilities linking the Midlands to continental Europe • UK engineering and product design in resurgence with Coventry and Warwickshire well placed • UK's largest manufacturer of advanced telecommunications equipment located in Coventry providing great impetus for exporting	• persistent variations in prosperity within the sub-region - city and north Warwickshire experiencing slightly higher levels of unemployment than the east and south of the county • businesses failing to respond to international requirements on quality, cost and environmental standards • continued rationalisation of dominant larger employers with consequent effects on supplier chains and loss of local control of productive facilities • commuters or people moving into the area benefiting from the creation of new jobs rather than residents or local 'returners' • recent trend for Asian businesses to consider relocating to the currently economically buoyant Indian subcontinent and using their Coventry or Warwickshire site as a factoring unit only

Source: Coventry and Warwickshire Partnerships (1995) pp.6-7.